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SUTURE OF THE RECURRENT LARYNGEAL NERVE FOR BILATERAL ABDUCTOR PARALYSIS.....	481
FRANK H. LANEY, M.D.	BOSTON, MASS.
TREATMENT OF SUPPURATION OF THE LUNG	485
CARL ROGERS, M.D.	NEW YORK, N.Y.
OBLITERATIVE OPERATIONS FOR MASSIVE EMPYEMA	506
CASPER F. HEGNER, M.D.	DENVER, COLO.
POSTERIOR MEDIASTINAL ABSCESS FOLLOWING SUPPURATIVE ARTHRITIS OF CERVICAL VERTEBRÆ.....	511
LEWIS CLARK WACHS, M.D.	NEW YORK, N.Y.
ACUTE SUBPECTORAL ABSCESS.....	517
HENRY MELCH, M.D.	NEW YORK, N.Y.
PULMONARY EMBOLISM	528
LYMAN S. HALL, M.D.	RICHMOND, UTAH
HARELIP AND CLEFT-PALATE	534
WARREN B. DAVIS, M.D.	PHILADELPHIA, PA.
PSEUDO-CARCINOMA OF THE STOMACH	535
VERNON C. DAVID, M.D.	CHICAGO, ILL.
TREATMENT OF ULCER OF THE STOMACH AND DUODENUM	564
JOSEPH L. DECOURCY, M.D.	CINCINNATI, OHIO
INTUSSUSCEPTION OF THE SMALL INTESTINE INTO STOMACH THROUGH A GASTRO-ENTEROSTOMY STOMA.....	574
J. P. SHEARER, M.D. and E. M. PICKFORD, M.D.	WASHINGTON, D.C.
GASTRO-JEJUNO-COLIC FISTULA.....	578
BENJAMIN RICE SCORE, M.D.	NEW YORK, N.Y.
SURGICAL INTERVENTION IN EXTRA-UTERINE PREGNANCY	581
HENRY P. BROWN, JR., M.D.	PHILADELPHIA, PA.
FRENCH-HEEL FRACTURES OF THE TARSAL SCAPHOID	587
V. W. MURRAY WRIGHT, M.D.	PHILADELPHIA, PA.
TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY.....	593
STATED MEETING HELD DECEMBER 5, 1927	
TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.....	604
STATED MEETING HELD DECEMBER 14, 1927	
STATED MEETING HELD JANUARY 11, 1928	
BRIEF COMMUNICATIONS: <i>Roder</i> : Nonmalignant Papilloma of the Umbilicus, 636. <i>Hinton</i> : Chronic Pancreatitis in Routine Necropsy Examination, 637. <i>Patterson</i> : Transverse Incision for Unilateral Hernia.....	639
BOOK REVIEW: <i>Morse</i> : Exigencies of a General Practice	640

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ANNALS *of* SURGERY

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No. 4

SUTURE OF THE RECURRENT LARYNGEAL NERVE FOR BILATERAL ABDUCTOR PARALYSIS*

BY FRANK H. LAHEY, M.D.

OF BOSTON, MASS.

ONE reason for reporting the following case of successful direct anastomosis of the recurrent laryngeal nerve in a case of bilateral abductor paralysis is to put the case on record. The main reason, however, is for the purpose of demonstrating that there are cases, perhaps only occasional ones, in which the nerve trunk itself may be found, freed from its scar and sutured successfully, and to encourage others to investigate the possibility of such a procedure early in the course of this very distressing condition for which operative procedures have so frequently been unsatisfactory.

The patient was a woman, aged forty years, unmarried, and a stenographer by occupation. She had been operated upon for exophthalmic goitre by a surgeon in a neighboring city eight months previously, a subtotal thyroidectomy being done. Her voice disappeared completely for two months after operation and, although now able to talk in a high-pitched voice, she still has spells of hoarseness, and since the operation has been having increasing difficulty with breathing, until now any unusual exertion threatens her with suffocation. Five months after the operation the thyroid remnant on the left side of her neck began to enlarge, and she became very nervous and weak.

The patient entered the clinic June 11, 1926, because of persisting thyroidism and difficulty in breathing. She was examined by Dr. T. W. Herman, associate laryngologist to the Deaconess Hospital, who reported: "This patient has a bilateral abductor paralysis. The glottic space is so small that one would expect dyspnoea on the slightest exertion. Good adduction and, therefore, her voice sounds are almost normal. General anaesthesia absolutely contra-indicated."

On June 25, 1926, with local anaesthesia, the skin flap of the previous operation was elevated, the prethyroid muscles on the right side were cut, and the small stump of thyroid tissue remaining after the previous lobectomy was freed and turned inward. Behind this the right recurrent laryngeal nerve was found and followed up to the horn of the thyroid cartilage. Just below this point a neuroma was found in the nerve where it was caught in a pale thick scar fixing it to the lateral laryngeal wall. Some of the fibres of the inferior constrictor muscle were cut away, so that the upper portion of the nerve could be demonstrated. The nerve was freed from the scar, the segment of the nerve containing the neuroma was removed and an end-to-end suture of the nerve made without difficulty and without tension, using two interrupted oiled silk vessel sutures.

On July 1, the patient was discharged with the wound clean.

On August 3, of the same year, the patient was seen again and states that her voice is lower pitched and that she has been breathing much better since the operation.

On October 19, 1926, the patient was again seen and reports that she is now able to breathe well, goes up and down stairs without difficulty in breathing and that her

* Read before the American Surgical Association, May 14, 1927.

voice is much better. She was examined by Doctor Herman on this date, who reported definite movement in her right cord.

This patient was last seen on March 17, 1927; able to breathe well and has been at work for several months. She was seen by the laryngologist, Doctor Herman, on this date, who reports as follows: "The right cord shows definite movement. It has by no means the normal excursion, perhaps one-third abduction, while adduction is good. The left cord is fixed. Her speaking voice has good tone quality. The glottic space is ample for all ordinary activity."

"She has recently had an acute infection of the upper respiratory tract without any local discomfort. It is possible that still greater motility may develop in the movement of the right cord."

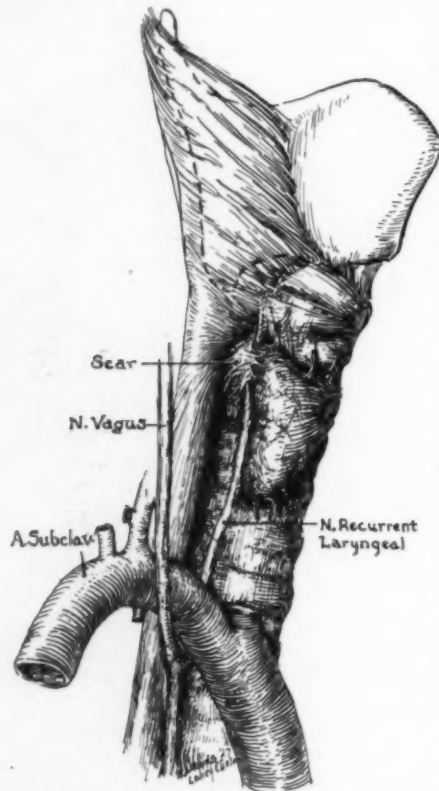


FIG. 1.—Shows the scar binding the nerve to the larynx. The remnant of thyroid gland has been turned forward.

In view of the pre-operatively demonstrated bilateral abductor paralysis, the narrow glottic space, the symptoms of respiratory difficulty and the operative demonstration of the scar in the nerve, the complete severance and suture of the nerve with return of abduction, widening of the glottic space and relief of breathing difficulty, it would appear that there can be little question but that this is a successful suture of the recurrent laryngeal nerve with return of function.

Although no report of a successful suture of the recurrent laryngeal nerve could be found in the Boston Medical Library, nevertheless it is quite probable that successful suture has been accomplished before.

We have been extremely fortunate regarding this lesion. In an operative experience with 4700 thyroid operations upon approximately 4000 patients, we have never seen bilateral

abductor paralysis as an immediate or remote complication of the operation.

The innervation of the muscles of phonation and the effect of injury to the superior and inferior laryngeal nerves upon those muscles is by no means a settled situation. We may summarize our knowledge of this subject briefly as follows:

Russell¹ demonstrated in 1892 that the recurrent laryngeal nerve has two sets of fibres; that they may be separated into two bundles and stimulated separately, one producing abduction and the other adduction. Grabower is said to have shown that there are twice as many fibres in the adductor bundle (680) as in the abductor bundle (281). Semon and Horsley² demonstrated

SUTURE OF THE RECURRENT LARYNGEAL NERVE

that prolonged stimulation of both bundles results in paralysis in the abductor bundle sooner than in the adductor bundle.

Hooper³ and Donaldson⁴ demonstrated that electrical stimulation of the entire nerve, of increasing strength, produced varying effects upon the cords, first abduction and then adduction.

It has been assumed and generally accepted that if the recurrent nerve is completely paralyzed, as by cutting, the cords will assume the cadaveric position which leaves ample breathing space between them. New,⁵ however, states that following subtotal thyroidectomy and injury to the recurrent laryngeal nerve, the cords do not assume the cadaveric position, but the position of adduction. He also states that those cords which may at first assume the cadaveric position later reach the median position. This would account for the difficulties in breathing which come on occasionally a few months after the subtotal thyroidectomy.

On almost every side of this question one may find conflicting opinions and contradictory experiments, so that it must be admitted that our conception of the mechanism of the vocal cord abnormalities which occasionally follow operations upon the thyroid gland are not satisfactory.

It is quite probable that time and further investigation will demonstrate that the superior laryngeal nerve is less of a sensory nerve and more of a motor one than is now so frequently assumed. If this is so it will clear up some of our present probable misconceptions. Dilworth⁶ has published a fairly recent paper (1923) dealing with the anatomy of the nerves of the larynx based upon naked eye dissections of 33 human larynxes. His conclusions so admirably summarize the situation as to the laryngeal nerves that they are set down here.

He states that there are four ways of looking at the laryngeal nerves:

1. The classical way, following Luschka, that they are separate sensory and motor nerves.
2. The school of Exner, which says that they are mixed motor and sensory nerves, and that each muscle received a double nerve supply.
3. An obvious middle way, which says that the nerves are mixed nerves, but which denies that all the muscles of phonation have a double nerve supply. (Dilworth found that the interarytenoideus was supplied by both the internal (a branch of the superior laryngeal); and the recurrent laryngeal nerves, but that the rest including the cricoarytenoideus posticus had only a supply from the recurrent laryngeal nerve).
4. He does not believe that this fits in with all the facts, such as the



FIG. 2.—Shows the direct suture of the nerve and cut fibres of the inferior constrictor. The remnant of the thyroid gland has been turned forward.

demonstrated connections (ramus communicans) between the superior and inferior laryngeal nerves and their branches and suggests that just as the vagus breaks up into various plexuses in the body, it does the same in the larynx and becomes a highly modified plexus here.

It seems that there will always be great difficulty in the study of post-operative abnormalities of the muscles of phonation following thyroid operations, because while one may see that some injury to the innervation of these structures has taken place and the variation in position of the cords may be observed, nevertheless it is not possible to know where the injury to the nerve is or what the injury is, so that a constant type and location of nerve injury may be related to constant positions of the cords following this injury.

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TREATMENT OF SUPPURATION OF THE LUNG*

BY CARL EGGERS, M.D.

OF NEW YORK, N. Y.

FROM THE LENOX HILL HOSPITAL

As a basis for this study I have selected the cases with intrapulmonary suppuration who were admitted to the wards of the Lenox Hill Hospital during the last five years, and have added such other cases for illustrative purposes which have received my personal attention over a somewhat longer period. There were 105 patients in all. A few developed an acute condition at the hospital, others were admitted in the acute stage of the disease, but the majority were subacute or chronic at the time of admission. Some of the patients came to the hospital because of an acute exacerbation, others who had become accustomed to their affliction, because they based their hope for relief on some new method of treatment, and a few were so discouraged or desperate that they were willing to have anything done.

For purposes of study and treatment it is practical to classify patients into groups. In the literature one finds several classifications, some help one in understanding the disease, others lead to more confusion than already exists. It is sometimes not possible to assign an individual case to any well-defined group. Though cases may differ as to etiology and early pathology, they may become more nearly alike as the process continues. For this reason the terms acute and chronic lung suppuration have been much used of late. In addition to the consideration of the time element, however, I believe that the division of cases into the following three main groups is of value:

I. *Suppurations limited to or originating in the bronchial tree, known as bronchiectasis.* From the nature of the condition it is apparent that aspiration of foreign substances, infected or otherwise, is the probable etiological factor. The process may start insidiously or more acutely. At times the inflammation is confined to one lobe and remains there, at other times a gradual extension to other lobes can be made out until the process is bilateral in character. The lower lobes are affected more often than the upper. While in the beginning the inflammation is no doubt limited to the mucous membrane, leading to thickening and profuse exudation, it later spreads to the surrounding tissue and produces a pneumonitis and finally fibrosis. In those cases of aspiration in which putrefactive and pus-producing organisms play a rôle, a destructive process may start early, leading to a rapidly spreading gangrenous abscess. In the less severe cases the walls of affected bronchi may become weakened, leading to a slow perforation with gradually developing secondary abscess, a so-called bronchiectatic abscess.

* Read before the New York Surgical Society, January 11, 1928.

II. *Suppurations of the lung parenchyma outside the bronchial tree, commonly known as lung abscess.* They are much less common than those of the first group. They usually start in a pneumonic focus with breaking down of tissue and liquefaction. Much depends on the organisms involved. It is probable that pure pneumococcus infections infrequently lead to abscess formation. The latter is more common in broncho-pneumonias of streptococcus or staphylococcus origin and where pus-producing organisms act as secondary invaders. Another common cause of these abscesses are septic emboli car-

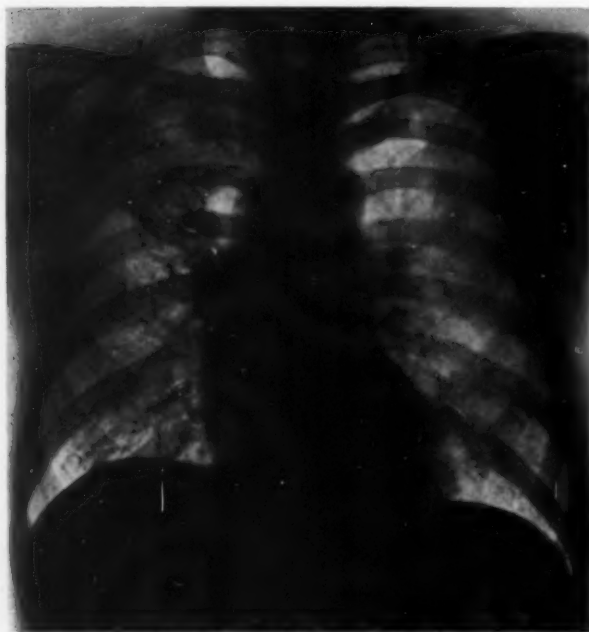


FIG. 1.—Acute lung abscess, right upper lobe with cavity found also on fluid level.

ried to the lungs through the pulmonary circulation. Another possible cause is an aseptic infarct which secondarily becomes infected. In case the infection is of low virulence, the abscess may later become well encapsulated and pass into the chronic stage. Coincident with this development the walls become hard and sclerosed and eventually the entire process may resemble a bronchiectatic abscess. In the more virulent infections, on the other hand, the abscess steadily increases in size, there is destruction of tissue, possibly

with gangrene. Eventually it may perforate into a large bronchus or pleura.

III. *Massive gangrene of the lungs.* This classification is reserved for those cases in which a large portion of a lobe or an entire lobe becomes gangrenous and is extruded. It is probably always due to blocking of a blood-vessel by a septic embolus or thrombus with massive destruction of the involved tissue. A secondary exudate will develop around this necrotic mass of lung and the clinical picture presented is that of an empyema, perhaps with signs and symptoms suggestive of an intrapulmonary lesion. The condition is not common, at any rate it is not often diagnosed. Of our cases only three belonged to this group.

What becomes of all these acute intrapulmonary suppurations if left untreated or if treated only by medical means, by many authors called expectant treatment? One of several courses may be followed.

1. Some of the very septic cases, with high fever and prostration, run a

TREATMENT OF SUPPURATION OF THE LUNG

rapid course and end fatally. They are nearly always associated with spreading gangrenous inflammation.

2. That a certain number of the milder forms heal spontaneously is well known. In some of these the true pathology may not even have been recognized. They may have been diagnosed as pneumonia with delayed resolution, chronic pneumonia or putrid bronchitis. Modern investigations have repeatedly uncovered such cases to be really lung suppurations. Then there are some empyema cases originating from a peripheral lung abscess which could not be recognized and were not even suspected and which heal while the empyema is draining. But there are also real lung abscesses or early bronchiectasis cases, recognized as such, which go on to complete cure. On account of the diagnostic difficulties, it is manifestly not easy to give definite percentages of such cures, nevertheless several authors have given us statistics. Whittemore¹ reports about 13 per cent. recoveries, Miller and Lambert² 50 per cent., Lockwood³ 59 per cent., Wessler⁴ 33 per cent., Lord⁵ 11 per cent. To interpret such wide differences is not easy, the explanation has to be sought in differences in virulence, especially in different parts of the country and under different climatic conditions. Some authors have reference to special types of cases only, and some may include in their statistics cases which are rejected by others. It should be our aim to include only such cases as by a combination of history, symptoms, physical signs and Röntgen-ray become clinically recognizable. Even then it is difficult to reach a definite understanding, because in the beginning the process may be what is called putrid bronchitis, or broncho-pneumonia, or an infarct, especially in the post-operative cases. Many of these clear up and it is only when there is some disturbance with the expulsive mechanism, leading to retention of septic material, or when there is secondary invasion with putrefactive organisms, that the condition passes over into the stage of lung suppuration. The method of healing in these cases is by absorption or by evacuation *via* the bronchial tree. Among our acute cases there were only eight discharged as cured; the percentage is small as compared with several other authors, perhaps due to the fact that we included only such cases as complied with the diagnostic requirements mentioned above. The two following cases are illustrative of the group:

CASE I.—G. M., forty-one years old, was admitted May 28, 1927, complaining of cough and foul expectoration. He was taken ill five weeks previously with what was diagnosed as pneumonia. He had been in bed only one week. He had continued to have pain in the right side of the chest with cough, but without sputum. He perspired freely and ran an intermittent temperature. He had lost 20 pounds in weight.

Examination showed dulness over the right upper lobe with harsh breathing. There were no definite signs of consolidation or of a cavity. He expectorated foul-smelling pus at times and his breath had a "lung abscess" odor. Change in position did not increase the amount of sputum. Latter contained staphylococcus albus, micrococcus catarrhalis and pneumococcus. The X-ray examination showed density with a cavity and fluid level (Fig. 1). Largely on account of the non-communication with a bronchus, operation was indicated to prevent spreading of the suppurative lesion in the lung. The patient ran a septic temperature, and operation was advised, but he absolutely refused

and left the hospital, June 6, 1927, with a temperature of 103° , and went to the country. When seen a few months later he had regained his weight, had no symptoms, and the X-ray showed complete disappearance of the infiltration (Fig. 2).

CASE II.—R. S., sixty-one years old, was admitted October 29, 1924, with a suppurative lesion of the right chest of comparatively short duration. He complained of cough and expectoration of pus and blood, with considerable loss of weight. His temperature was normal. Sputum was negative for tuberculosis. Physical and X-ray examination showed a lesion of the right lower lobe which was diagnosed as bronchiectasis (Fig. 3).

As the patient showed tendency to improve slightly, he was discharged with instructions to remain under observation, which he followed. He made a complete recovery clinically and also as far as X-ray examination of his chest is concerned (Fig. 4).

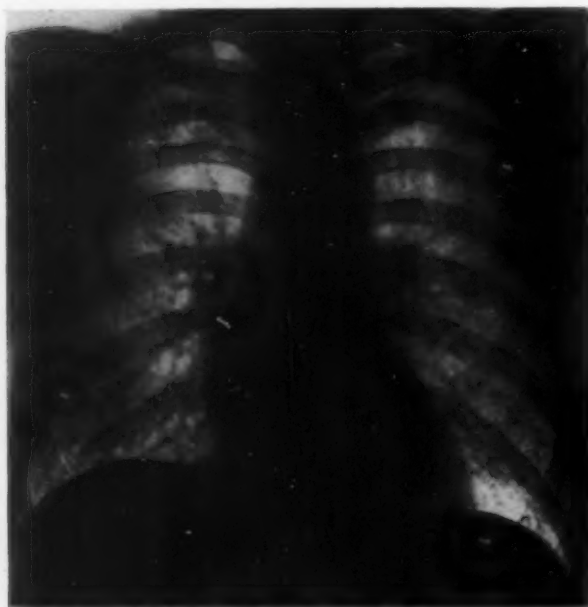


FIG. 2.—Acute lung abscess. Spontaneous cure, six months later.

3. Some abscesses perforate into the pleura. This is not an infrequent occurrence with those situated near the periphery. If the perforation is small, a slow leak results with a well-encapsulated pocket of pus. In case it is larger a regular empyema forms, which sinks to the lower part of the pleural cavity. Sometimes a sudden perforation takes place, especially during a coughing effort, resulting in an acute pyopneumothorax. A perforation into the pleura and bronchus may take place at the same

time. About two years ago I⁶ reported a group of ten cases of this type, all of which had recovered, indicating that perforation of a lung abscess into the pleura, especially if it takes place slowly, is prognostically a good sign. If the opening of the abscess into the pleura is large, sufficient drainage takes place and a cure will result by draining the empyema. If the opening is small, one may have to operate on the abscess later, as in three of the ten cases mentioned above.

4. The suppurative process may gradually pass over into the chronic stage. In case it is limited to the bronchi, bronchiectasis results. If on the other hand, the inflammation is situated in the parenchyma, it may spread and gradually involve more and more tissue, or it may encapsulate and become quiescent with an occasional flare up.

At any time during this acute period danger threatens the patient. How great that danger is depends on various factors, on whether the infection is

TREATMENT OF SUPPURATION OF THE LUNG

limited to the bronchial tree, or whether it is spreading in the lung parenchyma, also on the virulence of the organism and the resistance of the patient, or whether the suppuration is near the hilus or near the surface of the lung, and on whether blood-vessels are involved in the process. A complication may develop unexpectedly and interrupt an hitherto fairly satisfactory convalescence. A sudden pyopneumothorax may terminate fatally, there may be a severe hemorrhage, a focus of secondary pneumonia may develop, or embolism may result by a fragment being carried by the pulmonary vein to the heart and through it into the general systemic circulation to form a brain abscess or other secondary focus.

It is apparent therefore that alert watchfulness is in order, and that intervention may become necessary at any time. As long as convalescence is satisfactory, and there is slight steady improvement, one should carry the patient along until cure results or to a stage when the acute symptoms have been overcome and the danger of spreading sepsis has been reduced. During this period every measure calculated to favorably influence the condition must be utilized. Due attention must be paid to the general condition of the patient, his age and his habits. Absolute rest in bed is of primary importance, the diet should be calculated to be high in caloric value and easily digestible. Stimulation should be used to strengthen the heart. In all those patients who have a positive Wassermann, salvarsan injections and other antisppecific treatment should be instituted.⁷ Spirochaetes have frequently been found in the pus of lung abscesses.⁸ Whether they are the primary cause of it or are to be considered secondary invaders is not definitely known. It is known though that salvarsan injections at times favorably influence the disease. One should therefore bear it in mind and use it in rebellious cases. Then there is postural drainage, the effect of which is often very striking. The patient himself usually discovers the position favoring good drainage, and one should be guided by him and prescribe emptying of the cavity three or four times a day. In other cases no benefit results from this treatment. If in spite of these measures no improvement takes place, or the condition tends to gradually get worse, some form of more active interference has to be considered. This applies alike to the rather acute cases which do not improve, and to those patients who come under observation after they have reached the chronic stage.

What can be done? In order to answer that question one has to know what one wants to accomplish. Drainage is naturally the one object to be sought, drainage either by way of the bronchial tree or through the chest wall. It is, however, not so easily accomplished as in other parts of the body. One has to consider the respiratory and circulatory mechanism in working out a plan of action, in addition to the element of infection, for anything that is done may seriously embarrass either of these two systems and thereby lower the vital capacity of the patient, even to such a degree that death may ensue.

The first thing to do therefore is to make an accurate diagnosis or as near accurate as possible. A good history is most important. Careful bacteriological examinations of the sputum should be made. Physical signs are known to be often very misleading or even absent. The Röntgen-ray is of the greatest value. One should therefore have good pictures made in different positions, preferably stereoscopic. They will show the extent of the lesion, whether near the front or the back, near the surface of the lung or near the hilus, whether breaking down of tissue has taken place, with a fluid level in the cavity or not. One also learns whether there is displacement

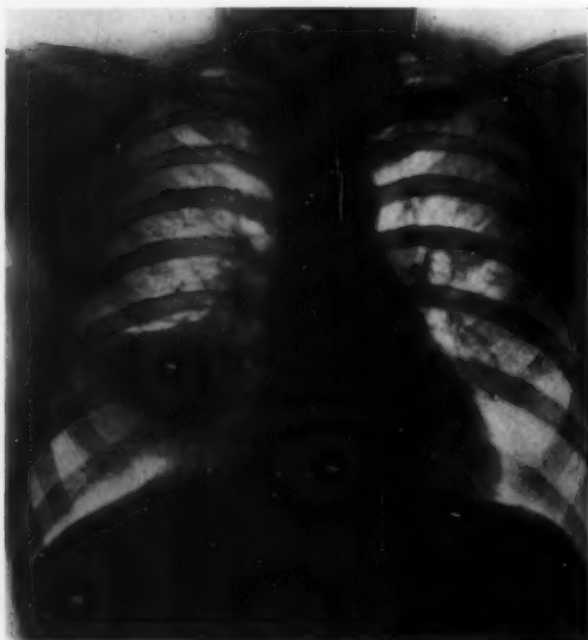


FIG. 3.—Bronchiectasis of right lower lobe of short duration.

of the heart or the presence of an empyema. The greatest aid, however, in addition to the X-ray, is the bronchoscope. By bronchoscopic examination, for instance, we are able to learn definitely from which lobe pus exudes, whether perhaps a tumor of the bronchus or a foreign body is responsible for the suppuration, or whether strictures are present. Above all, however, by injecting the affected lobe with iodized oil it is possible to demonstrate fairly conclusively whether one is dealing

with a lung abscess or a bronchiectasis. When all these facts are known, it is possible to work out a plan of action.

At the Lenox Hill Hospital we are so much impressed with the value of bronchoscopy as a diagnostic measure that practically all cases with suspected suppuration are referred to that department. We are very fortunate to have Doctors Kernan and Oberrender in charge of the work, whose untiring efforts and patience have done much to advance our understanding of lung suppurations. It isn't only in diagnosis, however, that advance has been made, but in the treatment of these unfortunate cases. Many patients are admitted directly to that department for purposes of treatment, which may be carried out on ambulatory cases or on hospital patients. Usually a bronchoscopy is done once a week, at which time strictures are dilated, tubes are passed into the affected lobe, tenacious mucous plugs and pus are removed by suction and some antiseptic solution is injected for the purpose of influenc-

TREATMENT OF SUPPURATION OF THE LUNG

ing the inflammatory process. Most of the cases included in this paper have had a diagnostic bronchoscopy, and the majority have also been treated for a longer or shorter period. If it is found that the condition in a certain patient is not suitable for this treatment or that operation is indicated, he is referred to the surgical department. This does not mean, however, that all patients who do not promptly respond to bronchoscopic treatment are sent to the surgeons. They are referred only if definite indications for surgery exist. Otherwise the treatment is continued for a long time, even several years, in the hope of favorably influencing the process. This applies of course especially to cases with bronchiectasis of limited or great extent. Conferences are held from time to time with the surgeons to pass on doubtful cases. The impression that has been gained so far is that bronchoscopic treatment is of distinct value, especially in early cases.

The following case is an example of what may be accomplished by bronchoscopic therapy:

CASE III.—L. S., forty-eight years old, came under observation, October, 1924, on account of a hacking cough, loss of weight and strength, but only slight expectoration. There was dullness over the right side of the chest, anteriorly and in the axilla. The temperature was not raised. Tuberculosis was suspected but numerous examinations were negative. The X-ray showed a dense shadow in the region of the right middle and lower lobes, suggestive of a lung abscess (Fig. 5). At a bronchoscopic examination pus was seen to ooze from the right upper bronchus. With rest in bed and prolonged weekly bronchoscopic treatments, the condition gradually cleared up, the patient gained weight, and eventually completely recovered (Fig. 6).

As there is considerable difference in the cases with lung suppuration, it is well to consider the more active treatment under the headings of the three large groups mentioned above.

A. Treatment of Bronchiectasis.—Much depends on whether the case is seen early or late, whether it is limited to one lobe or bilateral in extent. In those cases in which the infection is limited to the bronchial tree, with perhaps small cavities due to dilatation of some of the bronchi, and regardless of whether the surrounding lung parenchyma is infiltrated and fibrosed or not, the object to be achieved naturally is to try and favor drainage by way of the bronchi. Postural treatment is of great help, as all the infected bronchi communicate with the larger trunks. Inhalations to help fluidify the secretion and make it less odorous are of value. This treatment may be supplemented by bronchoscopic therapy. By dilating strictures, cauterizing granulations, and sucking out tenacious secretion one may open up paths for better drainage. It is also possible to inject antiseptic or astringent solutions to favor healing. In the very early cases one may even remove the offending infectious agent which has gained entrance by aspiration, and thus abort the process. Myerson⁹ has shown by bronchoscopic studies after tonsil operations that in a large proportion of cases blood is found in the tracheobronchial tree as well as in the pulmonary tract, and concludes that it isn't the aspiration as such which does harm, but the fact that it cannot be expelled in certain patients, owing to some impairment of the expulsive

mechanism. If this is conceded to be true, it is evident that early bronchoscopy aimed at the removal of such aspirated potentially infective material, should cure these cases. Myerson,⁹ Meyer,¹⁰ Miller,¹¹ Jackson,¹² Kernan¹³ and others have put this method into practical use and have reported numerous cures.

It is known that bronchiectasis is at first often a localized lesion, and that later one bronchus after another becomes infected, until an entire lung or both sides are involved. It is very desirable therefore to utilize all means to combat the disease in this early stage, and there is at present no method

equal to or superior to bronchoscopy.

If these measures fail, artificial pneumothorax may be tried alone, or in conjunction with bronchoscopy. If we consider that one of the reasons for failure is the inability of the lung to collapse and empty itself owing to the negative pressure in the pleural cavity which keeps it expanded, it is conceivable that compression or collapse will favor drainage *via* the bronchial tree. This method has been tried by a number of authors, and while Küttner,¹⁴



FIG. 4.—Bronchiectasis right lower lobe. Spontaneous cure. X-ray three years later.

Lambert and Miller,¹⁵ and Lockwood¹⁶ do not consider it to be of much value. Whittemore,¹⁷ Tewkesbury¹⁸ and Lilienthal¹⁹ feel that at times it may be of help. Like every other method of treatment, it is probably of real value only in the suitable case. It should be used especially in early cases in whom no serious structural changes have taken place in the bronchi. It seems logical that the requirements for success would have to be a free communication with the bronchial tree, that there should be no pleural adhesions, and that the lung tissue surrounding the infected bronchi must be resilient, soft and collapsible. I have described such a case in detail,²⁰ in which the result was very striking, and in which there appeared to be a selective action, in that after compression or collapse of all the lobes, reexpansion took place only in the normal lobes, while the diseased one remained collapsed permanently. In cases with marked infiltration of the lung parenchyma, sometimes called suppurative pneumonitis, which is inca-

TREATMENT OF SUPPURATION OF THE LUNG

pable of compression or collapse, the treatment will naturally be of little value. The same applies to old chronic cases with fibrosis.

If no result is obtained, other means to bring about compression of the lung may be resorted to. A phrenicotomy may be performed or finally some form of surgical collapse, so-called extrapleural thoracoplasty. The extent of this would have to depend on the extent of the intrapulmonary lesion. This operation is usually applied in the more chronic cases with extensive unilateral involvement. It does not cure, and some authors have little faith in it, but it often brings about great amelioration of symptoms, and for this reason several writers, notably Hedblom,²¹ perform it in suitable cases.

If all these measures fail, is there anything left to do, or should anything else be done? Much depends on the condition of the patient. If he has been improved considerably by bronchoscopic treatment or a collapse operation, if the amount of sputum has been diminished and is non-odorous, the best advice is to be satisfied. If on the other hand there has been no improvement, if the sputum is copious and of a disagreeable odor, making the patient's life miserable and him practically an outcast, some more radical step may be proposed, either a direct approach to the suppurative focus or a lobectomy. The cases in which these operations are indicated are naturally those with a unilateral lesion and preferably those with involvement of only one lobe.

By direct approach is meant an operation *via* the thoracic parietes directly into the suppurating lobe. In true bronchiectasis, as we consider it to-day, a drainage operation would seem to be of little value, because not all affected bronchi can be reached. In actual practice, however, it has been found that a bronchial or pulmonary fistula established in the centre of the lesion may by external drainage and aëration do away with the odor and improve the general well being to such a degree as to almost amount to a cure.

By the gradual destruction of the lobe, as lately proposed by Graham²² and which he calls cauterization pneumectomy, much may be accomplished. The important points are that the affected fibrosed lung tissue, together with the infected bronchi, are actually destroyed. The reports published so far indicate that we have here a method of treatment giving excellent results with a comparatively low mortality.

It is in this same group of cases, a resistant disabling bronchiectasis, limited to one or two lobes, in which lobectomy is indicated. Graham,²² Robinson,²³ and others have reported successful cases, and Lilienthal²⁴ has shown that the results in the patients who have recovered are brilliant. The deterrent factor to-day is the high mortality attending such an operation.

B. Treatment of Lung Abscess.—In cases of bronchiectasis in which the infection has not remained confined within the dilated and sacculated bronchi, but has broken through and invaded the surrounding lung parenchyma in one or more places, bronchiectatic abscesses result. Such perforation may result early and lead to rapidly spreading gangrenous abscesses, especially in those aspiration cases in which putrefactive and pus-producing organisms have

entered. As a matter of fact the bronchiectasis has hardly time to develop before perforation takes place. In other cases the infection remains confined within the bronchi for some time and then a slow perforation takes place and gives rise to a gradually developing abscess. Both these types should then no longer be classed with bronchiectasis, but with the lung abscesses produced in other ways. They should, however, be given the benefit of conservative treatment and bronchoscopic therapy, for it is particularly in this group of acute post-operative abscesses that Wessler²⁵ reports a spontaneous cure of $33\frac{1}{3}$ per cent.

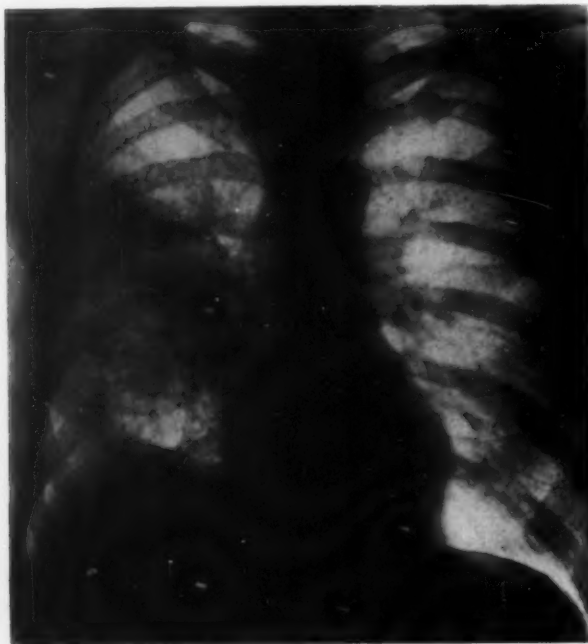


FIG. 5.—Lung abscess, right upper lobe. Probably bronchiectatic in character, insidious onset.

In a general way it may be said that the acute type of these abscesses with rapidly progressing destruction of lung parenchyma and liquefaction belong in the same class as acute lung abscesses following pneumonia or embolism, and require the same treatment. Lung abscess proper, meaning by that a collection of pus in the lung parenchyma, originating in either of the ways mentioned above, is a truly surgical condition, and drainage alone will bring about a cure, either by way of the bronchial tree or through

the chest wall. Nature may bring about such drainage by perforation into a bronchus or into the pleura, and thus lead to a cure. If it does not, it is up to the surgeon to establish drainage. At what time in the course of the disease should he intervene? That is a question not easy to answer. I think all thoracic surgeons are agreed that the earliest time consistent with safety is the best time, as it is most likely to lead to complete restitution to normal. Operations done very early during the acutely septic stage of the disease have a very high mortality and should be avoided. Then also one should give nature a chance. If we consider the pathological process within the lung to be a gradually progressing destructive one, as Hartwell²⁶ has so well described, it is possible to conceive of the process reaching either a large bronchus and breaking into it or the pleura and producing there adhesions to the parietal pleura which makes operation much safer, or an empyema, which according to reported statistics leads to a high percentage of

TREATMENT OF SUPPURATION OF THE LUNG

cures. Just how long one should wait has to be judged in the individual case. The majority of authors seem to feel that if no improvement or cure has resulted in two to three months, operation should be considered. If at any time during this period the condition gets worse, or the indications are clear cut, operation should be done earlier. No definite rules can be laid down, but it may be said that it is wise not to let a patient get into the chronic stage, because in this period many more complications threaten and a restitution to normal, even after operation, is longer drawn out and often is impossible.

In those cases in whom the lung has become adherent, the entire operative procedure may be carried out in one stage. It is best to resect a piece of one or two ribs, and after making sure of the location by an exploratory puncture, go right in alongside the needle. By means of a finger the opening may be enlarged and all the necrotic material and pus evacuated. If there is much bleeding a tampon should be packed into the cavity, otherwise a soft rubber tube or rubber dam should be inserted. In the more acute cases—those operated on within a few months after onset—one finds an irregular ill-defined cavity, with strands or septa running through it. The amount of pus and necrotic material found in these cases indicates that no free bronchial communication ever existed, at least not of a size sufficient to carry out this material. In case the lung has not become adherent, but the location of the abscess is superficial and has been definitely localized, a circular suture approximately the two pleural layers may be done, and a tampon then lightly packed into the wound for several days, when an opening is made into the abscess within the limits of the circular suture. Instead of a suture, one may simply pack gauze against the pleura which will favor formation of adhesions. More difficulty is experienced in those patients in whom no adhesions have formed. The abscess is usually situated deeply, and not easy to localize. It is necessary to open the thorax, palpate the lung, and after finding the infiltrated area, suture the overlying visceral plura to the parietal one. It is important to choose the proper place for the incision, so that the abscess comes to lie directly underneath. The procedure carries with it more danger than in the other cases and usually has to be performed under general anæsthesia. For these abscesses difficult to localize, Heuer²⁷ has proposed a method of approach which is safer than open thoracotomy. He advises stripping the parietal pleura from the thoracic wall over the point of approach as a preliminary step in the drainage operation, and for purposes of exploration. Before deciding on operation one should give these patients every chance to perforate into a large bronchus. The following case, in whom operation seemed indicated, but was advised against on account of the danger involved, and who eventually perforated and recovered, is reported to illustrate this point.

CASE IV.—T. K., thirty-one years of age, was admitted March 25, 1927, complaining of cough, expectoration of blood and pus and foul breath. Onset seven weeks previously with a severe cold. Continued at work. Two weeks later developed sticking pain in the lower right chest, and a few days later cough with expectoration. Cough increased

in intensity and sputum was composed of blood and pus and had a very fetid odor. These symptoms had continued until admission. Physical signs were negative except for little dulness and a few râles in the right axilla. There was 150-200 c.c. of sputum a day, which on culture showed strept-haemolyticus, strept-viridans, staphylococcus albus and micrococcus siccus. Repeated examinations were negative for tuberculosis. X-ray examinations showed a dense shadow in the right lower inner zones (Fig. 7). There was no fluid level. A diagnosis of lung abscess near the hilus of the lung was made. Bronchoscopic examination substantiated the diagnosis, but did not improve the condition. Lipiodol injection did not enter the area of consolidation, indicating that there was no large bronchial communication. He expectorated large quantities of pus, began

to feel better and gained weight. He was therefore discharged in the hope that he would evacuate his abscess completely through a bronchus. Apparently he did develop a good-sized perforation, for two weeks after discharge from the hospital he had a pulmonary hemorrhage with expectoration of much pus. He was readmitted but improved steadily, and the X-ray showed diminution in the size of the shadow. Improvement continued, and an X-ray taken November 16, 1927, showed complete disappearance of the shadow. (Fig. 8.) The patient has gained weight and is able to do his regular work.



FIG. 6.—X-ray taken nine months later. Complete cure after several months of systematic bronchoscopic treatment.

while hemorrhage assumes an important rôle. The surrounding lung tissue is firm and sclerosed, and has lost its elasticity, the bronchi are dilated, rigid and infected, and the blood-vessels friable. There is usually a well-defined fluid level. The lung may be adherent or not. On this largely depends whether the operation should be done in one or two stages. The condition of the patients also has to be considered in deciding this question, for they usually cannot stand very much and care must be taken not to overtax their strength. For this reason alone a two-stage operation offers advantages.

While in the more acute cases healing usually takes place fairly early after operation, it is often long drawn out in the chronic cases, and a bronchial or pulmonary fistula has to be maintained for a long time or even permanently. One reason for this is that old cavities become lined with epithelium which is continuous with that of the bronchi and prevents obliteration. Another reason for delayed healing is found in the lung tissue surrounding the old

In the chronic lung abscesses the danger of sepsis is usually less,

TREATMENT OF SUPPURATION OF THE LUNG

abscess cavity, which is infected and contains numerous little recesses filled with material which keeps up a mild suppurative process. The fistula thus acts as a permanent safety valve. Although not ideal, the results of drainage in these old cases are nevertheless so gratifying that the little discomfort is fully compensated for. Lobectomy would be the operation of choice were it not for the high mortality. If the cautery pneumectomy of Graham proves safe, it may be adopted as the method to cure many of these old cases.

After the fistula has existed for months or years, and no longer discharges pus, but simply a little mucus, and the X-ray shows a clear field, one may consider that it has fulfilled its purpose and allow it to close spontaneously, which in many instances it will do as soon as the tube is removed. In some cases, however, there are definite obstacles to closure and one has to operate. Many methods have been proposed, either of which may at times lead to the desired result. Some years ago I reported six cases of persistent bronchial fistula²⁸ closed with the aid of muscle flaps which remained healed and gave no further trouble.

C. Treatment of Massive Gangrene of Lung.—Knowing the pathology, suggests the treatment of this condition, which is thoracotomy with removal of the necrotic mass. Unfortunately the diagnosis cannot be made unless one operates. The clinical picture is that of an empyema, and at operation for this condition the demarcated lobe is accidentally discovered. This is perhaps an argument in favor of making empyema incisions sufficiently large to be able to look in. The prognosis is not necessarily bad, especially if operation is done fairly early. Cases V and VI mentioned under post-operative deaths belong in this class, and the following case, which was also published as Case VIII, in *Archives of Surgery*, vol. xii, January, 1926, is repeated in detail because it brings out the difference between massive gangrene and so-called gangrenous abscesses.

CASE V.—M. W., a woman, aged thirty-two, was admitted October 31, 1923, complaining of pain and swelling of the right arm and shoulder of eight days' duration. The pain was so severe that she was unable to sleep.

She had had a miscarriage three weeks before. Two weeks before she had a severe chill followed by fever which in turn was followed by pain in the right side of the chest, dyspnoea and bloody expectoration. Eight days before swelling of the right arm and shoulder developed. Examination showed an extremely sick woman with a temperature of 103.2°, pulse 150, and respiration 40. The right arm and shoulder were enormously swollen, red, hard and tender. Fluctuation was present over the entire upper arm, and shoulder motion was restricted. Multiple incisions were made, an enormous amount of pus being evacuated; on culture this showed staphylococcus aureus.

The patient was extremely septic, irrational most of the time and her condition was poor. A blood culture was sterile and the Wassermann reaction was negative. Two weeks after operation it was noticed that the right side of the chest was immobile. The percussion note was flat posteriorly and in the axilla, with absent fremitus and voice sounds. Anteriorly, breathing was harsh and accentuated. An exploratory puncture in the posterior right chest showed thick, foul-smelling pus which on culture grew staphylococcus aureus. On the following day a part of the eighth rib was resected under local anaesthesia. The temperature at this time was 102.6°, respiration 32, pulse 140. The empyema cavity was filled with putrid pus of which about 1000 c.c. was removed.

While evacuating it a large fragment of gangrenous lung, representing from one-fourth to one-third of a lobe, was extruded, exposing a red bleeding surface on the lower lobe of the lung.

Several open bronchi were noted. An iodoform tampon was packed against this bleeding surface and the thorax was then partly closed. The operation did not influence the temperature, for it did not come down until after six weeks. The patient was treated as though she had a regular empyema, and the cavity was gradually obliterated. The small bronchi closed spontaneously and did not prolong the convalescence. The patient was discharged January 16, 1924, about two and one-half months after admission,

in a much improved condition and with the thoracic wound healed. Examination of the gangrenous lung showed necrosis, although the architecture of the tissue and the outline of many of the cells was still preserved. Scattered through the lung were collections of coal dust pigment and here and there clumps of bacteria (cocci). The patient had probably had a septic infarct of the lung from the miscarriage and later desquamation of the entire affected portion of the lung, with secondary development of an empyema. As long as the pus was under pressure in the thorax it kept the necrotic fragment against the lung, but as soon as the pressure was released, it separated, exposing the bleeding surface.



FIG. 7.—Acute lung abscess. Probably post-pneumonic, situated deeply. Difficult of approach.

Of our total cases of 105 only 32, or 30 per cent., were subjected to some form of operative interference, usually a drainage operation in one or two stages. Of these 10 died, or 31 per cent., some soon after operation, others a long time after. These deaths are not all to be classed as operative mortality, however, for operation was in some instances undertaken in patients who were apparently doomed to die of their disease soon, merely in the hope of saving them. In others death did not come until a long time after operation and had no direct relation to it. The drainage operation simply failed to halt the process, and extension of the suppurative focus or a local or distant complication developed just the same. This again demonstrates that if a small pocket of infected material is left behind, an acute flare up may develop at any time. These patients died of their disease, not of the operation. The following are short histories of patients so classed:

CASE VI.—J. K., fifty-two years old, was operated on March 30, 1925, for carcinoma of the sigmoid. One-stage operation was performed. On the following day he had a

TREATMENT OF SUPPURATION OF THE LUNG

diffuse bronchitis with a temperature of 101.2° . There were loud moist râles over the entire chest, and the finger nails were cyanotic. There was no evidence of pneumonia. It was noticed that the patient had great difficulty expelling mucus and a croup kettle was therefore ordered. Condition gradually got worse. Eight days after operation consolidation could be made out in the right lower lobe, and two days later he had a great deal of foul-smelling sputum. By means of the X-ray multiple cavities could be demonstrated in the right lower and middle lobes. Sputum examination showed diplococci and short chain streptococci with a few Gram-negative bacilli, probably anaerobes. The condition looked hopeless, as the process was progressive, but in the hope of establishing drainage of the principal cavities in the right lower lobe, an operation was done two weeks after onset. The lung was found to be solid, with collections of this foul-smelling pus within the gangrenous tissue. An autopsy showed multiple lung abscesses on both sides. The abdominal condition was perfect, healing having taken place by primary union.

CASE VII.—P. F., sixty-three years old, was admitted March 10, 1926, with a septic temperature and an old neglected intrapulmonary suppuration. About eight months previously there had been a gradual onset with cough, expectoration and loss of weight. Conservative treatment had no effect. Under our eyes the process steadily extended. An operation was therefore done March 25, 1926. A section of the eighth and ninth ribs was removed. The lung and pleura had fused. The lung was entered by excising the exposed portion of thickened pleura and underlying tissue. Pus exuded from numerous channels. Multiple cavities were opened and drained, but this did not halt the process. More and more lung tissue became involved until the entire side was affected. The patient died seventeen days after operation.

CASE VIII.—J. D., twelve years old, was admitted January 17, 1923, with signs and symptoms of lung suppuration on the right side. It had started insidiously about two years previously. Röntgen-ray examination showed a deep-seated abscess around the root of the lung and extending into the right base. As there had been gradual progression in spite of conservative treatment during the last two years, operation was decided on and performed January 27, 1923. Sections of the seventh, eighth and ninth ribs were removed. The pleura was not adherent. Exploration revealed infiltration in the mid-portion of the lung close to the spine. This area was sutured to the parietal pleura and after drainage had been assured, the wound was partly closed. An empyema resulted which was drained through the established wound. On February 20, 1923, the abscess cavity within the lung was opened wide. By breaking or dividing partitions several cavities were converted into one large one, resulting in excellent drainage, with drop in temperature and improvement in weight and general condition. When almost healed, and after having been normal for a long time, the patient developed broncho-pneumonia of the opposite side and died June 2, 1923, four months after operation.

CASE IX.—V. M., thirty-one years old, was admitted June 8, 1927, with a suppurative lesion of the right lung, associated with a temperature of 104 . He complained of pain in the right chest and expectorated 200-400 c.c. of foul-smelling pus in 24 hours. He stated that his trouble had started six months previously with an attack of pneumonia which confined him to a hospital for three months. After discharge the cough had persisted and he had lost 25 pounds in weight. About a month before admission his condition had become worse, he had developed severe pain in the side and the sputum had increased in amount. His breath was foul. The sputum showed anaerobic Gram-positive diplococci. X-ray showed a cavity within a consolidated area in the right upper chest. Indications for operation were clear. June 14, 1927, operation: Incision posterior to scapula. Resection of a segment of the fourth and fifth ribs. Thick adherent pleura found. Exploratory puncture immediately followed by incision of a large cavity filled with pus and necrotic material. Large soft drainage tube inserted. Culture of pus

showed pneumococcus, non-haemolytic streptococci, micrococcus siccus and staphylococcus albus. After operation his condition improved considerably, temperature came down, and sputum was reduced to 25 c.c. in 24 hours. Then, unexpectedly, on July 6, there was a chill with a rise of temperature to 107.8. The chest signs were unchanged and the cause of the temperature could not be determined. It was assumed to be an extension of the process in the lungs. There was no vomiting or other complaint. The abscess cavity was clean and by means of a good-sized bronchus in the depth there was good aeration of the lungs. Four days later there was another chill with temperature to 108. Salvarsan injections had no effect. Blood culture was sterile. He gradually became somewhat jaundiced, which we at first attributed to the effect of salvarsan, but when he also developed tenderness over the epigastrium, metastatic abscess of the liver

was considered. He was too sick to have anything done, and after a few more chills he died July 15, 1927.

CASE X.—A. A., forty years old, was an old neglected case of gangrene of the lung with a contracted empyema drainage opening. The condition had existed for months. There was retention of pus which surrounded a completely demarcated and separated lower lobe of the right lung. The patient was in a septic state. An attempt to establish better drainage and to remove the necrotic lobe resulted in death. She died in spite of the operation, not because of it.

CASE XI.—M. S., forty-three years old, was admitted March 3, 1927, complaining of cough and foul expecto-

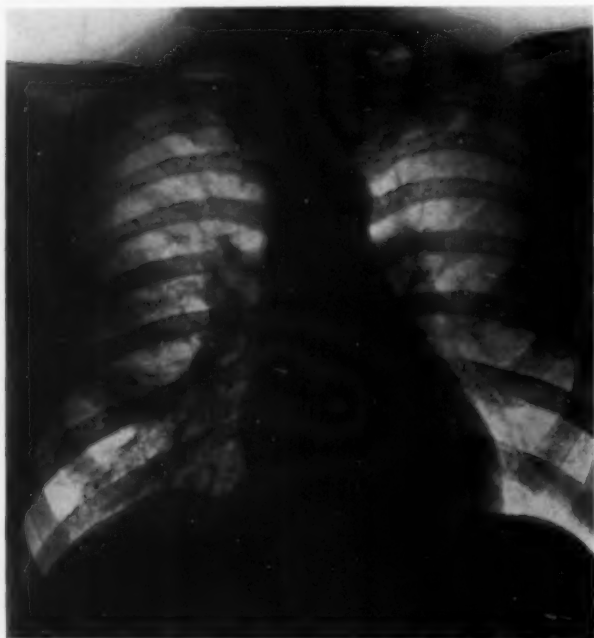


FIG. 8.—Cure by perforation of the abscess into a large bronchus. X-ray taken eight months later, complete disappearance of shadow.

ration since November, 1926. There had been a gradual onset of a respiratory condition in the early part of October, 1926, consisting of cough, pain in the lower chest, and fever. Cough gradually became worse and the sputum foul-smelling and larger in amount. He was finally sent to a hospital for bronchoscopic treatment and after about two months was discharged improved. While in the country his condition became worse and he was sent to our hospital. He had signs which were attributed to a lung abscess of the right lower lobe. Repeated sputum examinations were negative for tuberculosis. The Röntgen-ray showed marked density of the right lower lobe with a cavity. Bronchoscopic treatment had no effect and surgical consultation was requested. Operation March 30, 1927: Resection of 10 cm. of the ninth rib. Thick-walled empyema cavity entered which contained foul pus and a large gangrenous fragment of lung tissue. After removing this a large cavity, the size of an orange, was found in the lower lobe. It had a gangrenous lining. There were numerous bronchial openings. A section of tissue was excised from the margin of the cavity for diagnosis. In spite of excellent drainage the temperature did not come down to

TREATMENT OF SUPPURATION OF THE LUNG

normal and the patient gradually failed, and died May 1, 1927, of a general pulmonary tuberculosis. The fragment excised showed suppurative lung tissue and tuberculosis.

In only four of our cases can we actually speak of a post-operative death, in that it was the direct result of an operation deliberately undertaken to cure the condition. These patients could have perhaps continued their miserable existence a little longer, but none of them could have been cured without operation. As a matter of fact prolonged conservative treatment had been tried in three of them. They represent a true post-operative mortality of 12 per cent. The following are brief histories of these cases:

CASE XII.—H. L., twenty-one years old, was admitted August 3, 1923, with a history of having had a tonsillectomy performed nine months previously. This was followed by illness which gradually got worse, resulting in high fever two months later, and at a somewhat later time, increased cough and expectoration of foul sputum. At times there were hemorrhages. She was an anæmic, chronically ill patient. There was marked clubbing of the fingers. She had involvement of the right upper and middle lobes with three cavities showing on X-ray. An operation was done under local anaesthesia. A portion of the second and third rib was resected anteriorly. The pleurae had fused. The lung felt hard. An exploratory puncture showed thick foul-smelling pus. Cavity entered at once and pus and necrotic material was evacuated. The cavity communicated with two others. All three were converted into one, and an iodoform tampon lightly packed into it. The patient stood operation well. The next day her condition was fair, but on the following day she suddenly became worse and died, apparently of an embolus. The pathological report on excised tissue was chronic suppurative lung tissue.

CASE XIII.—S. S., fifty-four years old, had a cholecystectomy performed December 22, 1926. She developed a pulmonary complication which eventually resulted in a lung abscess, giving typical clinical and laboratory evidence. Operation was performed January 22, 1927, one month after her gall-bladder operation. Section of the fifth and sixth ribs was removed and an exploratory puncture done showing foul pus. A tampon was placed against the pleura and the patient returned to bed until the second stage of the operation three days later. At this time pus was seen to exude from the old puncture wound. The abscess was opened and thin foul pus evacuated from a lobe which was diagnosed as suppurating pneumonitis with gangrene. She died the same day of continued sepsis.

CASE XIV.—F. S., eighteen years old, had a history extending over ten years. Every conservative treatment had been tried, including bronchoscopy and artificial pneumothorax. There had also been two unsuccessful operations. There was involvement of the left lower lobe. The sputum contained short chain strept and a facultative anaërobe. Operation was performed October 29, 1925, with resection of a portion of the seventh, eighth, and ninth ribs. The pleura was not opened at this time. After this simple first stage she coughed more than before and the sputum increased in amount. She developed signs at the opposite base with bronchial breathing and high fever. After temperature had been normal for a while, the second stage was attempted on November 19, 1925. The lung was found adherent, it had a leathery feel. Punctures were negative. The patient took gas oxygen poorly and the operation had to be discontinued. She died the following day with marked cyanosis and dyspnoea.

CASE XV.—E. C., thirty years old, was admitted April 6, 1923, with a suppurative lesion of the right upper chest which had immediately followed upon the incision of an alveolar abscess with extraction of a tooth under general anaesthesia, one year previously. She was very sick and had all the typical signs and symptoms of lung suppuration. Operation was indicated and performed May 25, 1923. A portion of the second, third, fourth and fifth ribs was removed anteriorly. Three good-sized cavities were found.

The intervening tissue was removed and the cavities converted into one. Wound left wide open. Patient made a nice recovery and was discharged much improved with a clean wound June 19, 1923. Improvement continued for several months and then there was a sudden flare-up which necessitated readmission to the hospital. Lobectomy was decided on. Operation was performed October 29, 1923. The right upper lobe was resected without much difficulty. The operation was well borne and the patient recovered nicely, until the evening of the following day when she became cyanotic and expectorated bright red blood with each spell of coughing. She died in spite of all efforts to save her. The autopsy showed bronchiectasis and associated pulmonary tuberculosis of the remaining right middle and lower lobes. The cause of death was pulmonary embolus, the large embolus extending from the pedicle of the upper lobe down the pulmonary artery into the right heart and also up into the left branch of the pulmonary artery.

Of the patients who recovered after operation, twenty-two in all, seventeen are cured and five are classed as improved, of which four have a bronchial fistula. In one of these the fistula is ready to be closed, in another it will probably close spontaneously as soon as permitted to, and in two it will have to remain permanently.

Of the patients not operated on, sixteen died at the hospital. They were admitted because of their suppurative process, or for the primary disease of which the lung suppuration was a complication, or for complications such as secondary pneumonia, embolus, cardiac failure, etc., the result of long-standing suppuration. Two complicated a carcinoma of the œsophagus, one a carcinoma of the larynx, one a carcinoma of the tongue, and one followed a fracture of the jaw. Another case with multiple lung abscesses had a convulsion during bronchoscopy and died of brain embolus. The other ten patients were chronic cases in whom the etiology could no longer be definitely determined. Autopsies performed on some of them showed multiple degenerative lesions of other organs and usually multiple abscesses of the lungs.

All the other cases, those not operated on and those who did not die at the hospital, were either on medical treatment alone or combined with bronchoscopic therapy. There were fifty-seven such patients. Of this number ten are at present under treatment, while the remaining forty-seven are divided as follows: Twenty-one have been discharged as cured, eleven have been discharged as improved, fifteen have been discharged as not improved, of which a few have since died. The most gratifying group are naturally those discharged as cured. Among them were very striking cases with well-developed abscesses which either perforated into a bronchus and discharged that way, or were treated bronchoscopically by suction and instillation. There were, however, also very interesting cases of bronchiectasis which had not advanced far and had no serious structural changes, so that they were accessible to bronchoscopic treatment.

Those discharged as improved were much less satisfactory. Some have been followed, others have drifted away as clinic patients which a chronic illness are apt to do. It is therefore not possible to say whether they had recurrences, whether they were eventually operated on, or whether they died.

TREATMENT OF SUPPURATION OF THE LUNG

The majority showed so much improvement during the period of observation that operation was not indicated. Their condition had been improved to the degree that life was at least temporarily more bearable. It is well known that among those called improved an acute exacerbation may develop at any time, and that even among those classed as cured there are at times recurrences. The only real way to cure these chronic suppurations seems to be actual eradication of the suppurative lesion. Nevertheless, in view of the present high mortality we have not felt justified to subject all these patients to a radical operation. On the basis of experience gained so far, we rather feel inclined to continue the method now in use at the Lenox Hill Hospital, of referring all cases to the Bronchoscopic Department for diagnosis, and possibly for therapy, and instituting surgery only in those cases in which there is a definite indication. There is no danger, or practically no danger in bronchoscopy when done by an expert. The only danger to the patient may conceivably be holding him in that department too long, until a time that the process has become chronic, but that is easily obviated by regular conferences. The aim of all those interested is not to hold a patient, but to cure him.

The most unfortunate group is that composed of chronic bronchiectasis cases with bilateral involvement. In spite of prolonged treatment and by the use of every method known, these patients continue to present the most difficult problems. The aim should be to cure these patients before they reach this stage.

A study such as this demonstrates that non-tuberculous intrapulmonary suppuration is compatible with life, even for many years. How miserable that life will be depends on the extent of involvement, the patient's habitat and his mode of living, the amount and odor of sputum, and the condition of other organs. Patients who live an outdoor life are likely not to feel the ill effects as much as those living in close quarters in the city, and they are not so likely to be obnoxious to their surroundings. They eventually succumb to their affliction, be the immediate cause directly traceable to the local lesion, such as hemorrhage, or extension of the process in the form of a broncho-pneumonia or multiple abscesses, or a pulmonary embolus; or to the degenerative effect of long-continued suppuration on other organs with general exhaustion, or finally to distant complications such as brain abscess, meningitis, or liver abscess.

It would seem that unless conservative measures bring results in the acute cases in a reasonable time, some form of operative treatment is indicated, which in the abscess cases is drainage in one or two stages, and in the bronchiectasis cases, bronchoscopy alone or combined with artificial pneumothorax.

In the chronic cases drainage alone is indicated in those cases in which a cavity can be demonstrated, but in the other cases one is almost forced to the conclusion that some form of operative intervention which aims at the actual destruction of the involved lung tissue, or removal of the lobe, is the only means to bring permanent cure.

On the basis of the results shown, this paper is evidently not presented for the purpose of reporting a large series of cases with an unusually low mortality or morbidity, or to advocate one special form of treatment, but rather for the purpose of calling attention to the tragic outlook of patients with intrapulmonary suppuration. It is hoped that it may stimulate interest in this subject to the end that measures be taken to avoid the large number of post-operative cases, and that a better understanding of the pathology of the disease, with the mechanical factors involved in thoracic surgery, be brought about. In this way it is hoped operative measures, properly timed and executed, will eventually lower the appalling mortality and make it possible for a larger number of these unfortunates to survive and to lead a life free from the distressing symptoms with which they were afflicted.

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OBLITERATIVE OPERATIONS FOR MASSIVE EMPYEMA*

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THE object of all operations for empyema is the obliteration of the cavity. This may be accomplished by securing the reëxpansion of the lung by decortication or, more certainly and safely, by eliminating the rigidity of the cavity walls, diminishing the arc or curve of the bony parietes, and apposition of the relaxed parietal with the visceral surfaces of the affected pleural space. The obliteration takes place by fibrosis beginning in the angle of reflection and not between the apposed surfaces of the pleura.

To appreciate the difficulties that may interfere with successful obliteration, one must understand not only the factors which cause the empyema, but also those that prevent closure of the cavity.

The factors which may interfere with closure are:

(a) Of chest wall: Abscess, cellulitis of the skin or soft parts; necrosis of the rib; a rigid or osseous ring at the site of a drainage orifice; rigidity or peculiar structure of the bony chest wall; fusion of adjacent ribs.

(b) Of the pleura: A thickened, fibrous, rigid parietal or visceral pleura; long, tortuous, rigid sinuses leading to remote foci within the lung or pleural cavity; irregular, multilocular, encysted, inadequately drained intrapleural or interlobar empyema cavities; adhesions which withdraw, compress or bind the lung in an abnormal position; thick pus mixed with air, blood, fibrin, or sloughs; foreign bodies, pieces of tubing, gauze or fragments of bone.

(c) Of the lung: Pulmonary abscess or cavity, bronchiectatic cavities, especially those with small pleural openings or granular tracts; pulmonary or bronchial fistulæ.

The lung covered by a thickened, infected, chronically inflamed fibrous pleura is progressively compressed, its elasticity is lost or compromised to an irretrievable degree. The infection may extend into the parenchyma of the underlying lung or into the interlobular septa for a considerable depth. This may impede or forever render the lung incapable of reëxpansion to even approximately fill the thoracic cavity.

Early thoroughly controlled closed drainage must be instituted, to prevent the pleural surfaces exposed in an empyema cavity from becoming covered with a thick plastic exudate which, later, organizes forming a compressing fibrous membrane or thick tethering adhesions. This means as soon as aspirations have become ineffective or the exudate frankly purulent.

Open drainage is a menace and is to be avoided, except in localized encysted empyemas, in children, in women and in those with elastic thoracic walls.

* Read before the Western Surgical Association, December 8, 1927.

OBLITERATIVE OPERATIONS FOR MASSIVE EMPYEMA

Secure a rapid and as great a diminution of the cavity as possible and a maximum reëxpansion of the lung by early, conscientious practice of resistive breathing, positive intrapulmonary pressure or intrapleural negative pressure.

Sterilization of the cavity is lessening the virulence of the infecting organisms. Sterility of the fluid contents does not imply freedom of the tissue walls from bacteria. A residual cavity may, and frequently does, become reinfected with bacteria from the walls. The greatest degree of avirulence is secured by thorough drainage.

Irrigation may be combined with drainage. Bland solutions are quite as efficient as antiseptic solutions which are unsatisfactory. Dakin's solution, while not primarily antiseptic, when properly used has an advantage possessed by no other. The virtue of Dakin's solution as a cleanser is due largely, if not solely, to its proteolytic property. This proteolytic action liquefies fibrin, plastic lymph, non-viable and dead tissue. By removing this débris, bacteria are deprived of a fertile media. The viable tissue and body fluids are given an opportunity to develop resistance to and may overcome bacterial growth. The part then is in much better condition for any necessary operation (Graham¹).

Dakin's solution, due to its proteolytic action, is a chemical decorticating agent of considerable potency. By chemical decortication a surprising degree of reëxpansion may be secured (Graham²). Irrigation with chlorinated solution in cases with bronchial or pulmonary fistulæ is irritating to the bronchial mucous membrane and is contra-indicated. Recently occluded bronchial fistulæ may be reopened by liquefaction of the occluding plug.

The mechanical or operative removal of the contracting fibrous membrane by the decortication operation of G. R. Fowler³ and Délorme⁴ may, in rare instances, be of advantage. Délorme opened widely between the ribs and decorticated the lung. He called attention to the importance of the costo-vertebral groove by stating: "The essential to success is freeing the lung to the costovertebral groove." When the possible pathological changes in the underlying lung are considered, it is readily seen that a good result with a functioning lung is exceptional.

When the purulent exudate cannot be controlled, when the condition of the lung and pleura are such that a reëxpansion to fill the chest is no longer possible, then the chest wall must be contracted to meet the compressed lung.

All obliterative empyema operations are extensive and deforming. Frequently they are multiple, each succeeding step is more difficult and formidable than its predecessor. The debilitated state of many of these patients justifies, yes, often demands multiple stage operations. A sequence of operations is made necessary by the lack of a thorough pre-operative understanding of the intrathoracic conditions.

Given a case of empyema that has resisted early proper treatment, or one that has been neglected, the size, shape and topography of the cavity, the intrapulmonary condition, the trend and character of the ribs must be known before undertaking any operation. This will determine the site,

number and length of the ribs to be removed. A meticulous study of röntgenograms of different densities will give valuable information as to the condition of the lung, pleura and ribs. Röntgenograms taken in the erect, the horizontal and two lateral positions after the injection of some fluid contrast media, by completely delineating the cavity, will be of additional advantage (Hegner⁵). Small unsuspected pulmonary fistulae may be detected by the patient tasting the injected fluid. A 15 per cent. aqueous solution of sodium iodide is a satisfactory non- or slightly irritating contrast media.

The cavity, except in distinctly localized or encysted empyemas, frequently extends into and up the costovertebral groove. This is not uncommon in massive empyemas. Empyema involving the costovertebral groove cannot be obliterated by any of the usual rib operations.

Regardless of the importance of the costovertebral groove, the usual operations, by incisions in great variety of shape, trend and number through skin and soft parts, are all made with a view of removing segments of ribs from the lateral aspect of the chest. This method of direct approach to the empyema cavity ignores the fact, that removal of short segments posterior to the angle of the rib secures a much greater degree of collapse than the removal of long segments anterior to the angle. The collapse is as marked on massive anterior, on lateral as on posterior empyemas and those extending into the groove. Removal of posterior rib segments is the only method which can diminish or obliterate posterior empyemas.

The indirect approach through a straight or slightly curved paravertebral incision exposes the angles of the ribs. It gives easy access for removal of the segments posterior as well as any desired length anterior to the angle. The deribbing must extend well beyond the limits of the cavity.

The closed operations, of which Estlander's⁶ is the prototype, remove subperiosteal rib segments from the lateral aspect of the chest. Even though the segments are long, the degree of collapse is often inadequate. Quénu,⁷ in 1892, through a U-shaped incision mobilized an extensive flap of ribs and intercostal muscles of the lateral wall. He failed to obliterate the cavity.

The open operations follow the lead of Boekel,⁸ who after the removal of long segments of ribs, found the parietal pleura so tense, rigid and thick that it prevented obliteration. He made a cross-incision through the pleura, fashioned flaps which he compressed and held in place by large sponges. Boekel inaugurated the idea of flaps to secure obliteration. Though he accomplished closure, he recognized the necessity of extensive resection, going as far back as his L-shaped incision permitted.

Schede⁹ and others, by direct attack, remove the ribs with the intercostal muscles and nerves which form the outer wall of the cavity, doing an unroofing operation. The large fenestra is covered as completely as possible by replacing flaps of the skin and superficial muscles. This unroofing of the cavity, especially if it be extensive or deep, entails a useless sacrifice of tissue. It is undesirable in its immediate and remote effects. The large granulating surface is slow to heal, the discharge of serum and pus debili-

OBLITERATIVE OPERATIONS FOR MASSIVE EMPYEMA

tating, requires prolonged expensive dressings. Frequently, difficult plastic operations are necessary to close the defect. The completely deribbed area does not regenerate bone, it is unprotected. If very large and unsupported, respiration may be embarrassed and the underlying viscera endangered.

De Cérenville¹⁰ attempted to obliterate pulmonary cavities in the apex of the lung by removing segments of the upper ribs, including the first, from the front. The cause of his failure was the fact that the posterior ends of the resected ribs remain rigidly fixed in an extended position.

Bouveret,¹¹ though he removed the ribs laterally, states: "Encysted empyemas are more common in the rear. The resistance of the costal arc is more pronounced in the posterior half than in the anterior half."

Therefore, it is logical that a more effective mobilization of the chest wall can be secured by removal of segments of the ribs posterior to the angle as close to the spine as possible.

The inherent tendency of the rib is to spring outward. The outward spring is increased by contraction of the auxiliary muscles of respiration which are inserted into the anterior and posterior segments. When ribs are resected from the middle or lateral aspect of the chest wall, this outward spring is opposed from within only by whatever adhesions that may be present. Tension of adhesions from the rib stumps to the front and sides pull the lung farther away from the costovertebral groove, where adhesions are less extensive and the purulent residue is greatest. This increases rather than diminishes the size and capacity of the groove.

When a rib is resected in its middle area the normal elasticity is expended in the unopposed anterior and posterior stumps. They spring outward, lose their normal obliquity and assume a more horizontal position. Rigid buttresses consisting of an anterior and posterior row of stumps are formed. These buttresses interfere with rather than facilitate approximation of the chest wall with the retracted lung.

Boiffin,¹² November 17, 1894, after studying all previous operations for empyema, performed the first paravertebral thoracoplasty for collapse of an empyema cavity. Most of his predecessors recognized the importance of removing the posterior segment. On account of anatomical difficulties, fancied or real, none except Wagner,¹³ 1886, attempted the approach from behind. The Boiffin type of operation has been popularized by surgeons collapsing the chest wall for unilateral pulmonary tuberculosis.

A long straight or curved paravertebral incision is made about two and one-half inches from and parallel to the spinous processes. The spinal muscles are retracted backward and the scapula is retracted upward and forward. A subperiosteal resection of the necessary number and length of ribs is made flush with the transverse processes of the corresponding vertebrae of each rib. The most acute arc of the rib is removed. The cavity is not opened, provision for necessary drainage is made in the most dependent angle. No horizontal rigidly fixed posterior rib stump remains to interfere with obliteration. Greater and more uniform collapse can be obtained by

resecting short segments of ribs posterior to the angle than can be secured by resecting much longer segments of an equal or a greater number anterior to the angle. The downward and inward sinking of the chest wall is more effective than lateral compression. The pliable anterior segment is easily compressed and held inward by suitable dressings until bony regeneration takes place. The entire outer wall is retained, the ribs regenerate in tile-like obliquity, furnish support and protection. Prolonged dressings of large granulating surfaces incident to unroofing operations are seldom necessary. The incision can be so placed that it will not traverse the region of the necessary drainage tube. Infection of the wound is less probable and more easily controlled should it occur. The pleura may be opened as widely as desired for any intrapleural procedure that may be deemed advisable and resutured with ease. The scar and deformity is less conspicuous, obliteration of the cavity, lateral, posterior or costovertebral, is more rapid and the post-operative care is less irksome.

In empyemas of considerable size, those extending posteriorly and into the costovertebral groove, more especially those complicated by pulmonary fistulæ, the indirect or posterior approach by paravertebral thoracoplasty is the operation of choice.

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POSTERIOR MEDIASTINAL ABSCESS FOLLOWING SUPPURATIVE ARTHRITIS OF CERVICAL VERTEBRÆ

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MEDIASTINAL suppurations are rare, but when present are very serious complications and most often fatal. A thorough review of the literature shows there has been a good deal of discussion about the subject, but there are very few cases reported as cured by operative interference. It seems worth while adding a report of a successful case of this type to the relatively small number already reported.

Classification.—In general the origin of mediastinal abscesses have been thus classified:

(1) *Throat and Pharynx.*—Suppuration of peri-tonsillar origin and retro-pharyngeal abscess when due to a very virulent organism often make their way into the chest by direct extension and show very little local symptoms.

(2) *Structures of Neck.*—The superficial suppurations in the neck most always localize and are drained to the surface, but the deep inflammations behind the fascial planes tend to gravitate toward the mediastinum. This type usually follows inflammation of the deeper cervical nodes and in malignant diseases of œsophagus secondarily infected.

(3) *Operations on Œsophagus, Larynx and Trachea.*—Surgical treatment of most neck conditions is practically free from deep infection, but



FIG. 1.—X-ray shows bone involvement between fifth and sixth cervical vertebra.

operations for removal of larynx and œsophageal diverticula are most often associated with fatal mediastinal abscess.

(4) *Structures of Mediastinum.*—Acute infection either local, or by the blood stream, of the lymph-glands of mediastinum or surrounding tissues may end in suppuration. A liquefaction of a chronic tuberculous process may give signs of pressure with secondary infection by pyogenic organisms. There are cases, which are attributed to spondylitic abscess of the dorsal

vertebra, caries of ribs or pleural infection and malignant degeneration.

(5) *Traumatic.*—All wounds to the organs of the thoracic cavity may lead to mediastinal suppuration. The suture of stab wounds of the heart by a spectacular operation, only to have the patient succumb to infection over which there is very little control.

Clinical Classification.—Acute abscesses of the type under discussion occur at any age, but cases reported are mostly in men (85 per cent.). The cases reported in children were of tuberculous origin due to spinal caries.

The symptoms are not distinctive. The pres-



FIG. 2.—The sinus has been injected with bismuth, which shows tracts leading to diseased area and also toward chest cavity.

ence of a suppuration about the neck or operative procedures on œsophagus should be considered in relation to potential chest involvement, for most cases, whether the abscess is small or large, there is discomfort and actual pain in the posterior chest, about the shoulders or may even radiate to the abdomen. Dyspnoea and cough may be complained of due to pressure on the intrathoracic organs or nerves.

Diagnosis.—The physical signs may be extremely indefinite and great difficulty encountered in making a diagnosis. The patients are extremely sick and pain is usually of throbbing character. The acute cases are associated with fever, chills and sweats. A pulsating tumor may be noticed at the sternal notch.

There is hardly any chest condition which so tests the acuity of the diag-

POSTERIOR MEDIASTINAL ABSCESS

nostician. Percussion always reveals dullness to either side of the spinal column, while the anterior chest is resonant. Auscultation is not so important. The interpretation of the pain in my own case was extremely difficult as it was referred to the liver region and X-rays show diaphragm elevated on the right side, which made the suspicion of subphrenic abscess very great. The diagnosis can always be settled by the *exploratory puncture of the mediastinal cavity*, associated with a thorough röntgenological examination of the thorax. The laboratory findings do not throw much light on the subject, because of the co-existing presence of a primary known suppurating focus in the body.

Treatment.—The ideal treatment of course as soon as the diagnosis is established is surgical. Guadiani has classified the cases in an excellent article as follows: "*The abscess which gravitates not lower than the fifth dorsal vertebra can be successfully drained by a cervical mediastinotomy, while all others should be approached by rib resection through the dorsal route.*" This latter approach has been admirably described by Lilienthal in 1923 with a report of his case.



FIG. 3.—X-ray of chest before operation shows diaphragm elevated on right but costal angle not obliterated. The aorta and heart pushed to left, while there is marked increase in density behind the sternum throughout the chest.

CASE REPORT

The patient was a man, fifty years of age, whose general health had always been good. He had had the usual diseases of childhood and the past history otherwise did not seem significant. He had periodic examinations by his family physician and urine examination was always negative for sugar and albumin. His usual weight was 196 pounds.

About September 20, 1926, without any apparent trauma he developed an area of tenderness, redness and swelling, associated with fever, in the left lumbar region. Within a few days all the signs of a carbuncle of the back were apparent. This was excised and drained; the culture of the evacuated pus being *Staphylococcus albus*. The wound responded to treatment and daily dressings. The patient was free from symptoms.

The first part of December, 1926, when the wound was almost healed, he developed

a temperature as high as 106 degrees. There was pain in the left ear and slight rigidity in the left neck, but no definite localization of pus. The symptoms and signs of septicæmia were present and was proven by blood culture, which was positive for *Staphylococcus albus*. Ten days following onset of symptoms an abscess in the left ear was incised and a few days later signs of an abscess behind the left sterno-mastoid muscle made an appearance and was immediately drained. X-ray at this time revealed a destructive arthritis between the fifth and sixth cervical vertebra. The patient from then on had an extremely stormy time. The temperature varied for 101° to 106°



FIG. 4.—X-ray of chest five weeks after operation, showing resection of rib on left, the heart in normal position and no increased density in the chest. The diaphragm is much lower than Fig. 3. No collapse of lung.

daily. The wound in the neck seemed to be draining satisfactorily, but it was noted when drainage was slight the temperature was at its peak. There were no signs of foci about the body. Patient was given many transfusions of immunized blood, which seemed at times to check the fever. Further operative procedure did not seem to be indicated at this time.

In April, 1927, because the patient had developed signs of a chronic infection with daily rise of temperature, associated with varied muscular and articular pains, it was decided to fill the sinus in the neck with bismuth paste for a period of six weeks, with the object of keeping the sinus tract open. Following each injection of bismuth the patient had a severe reaction. After the last injection of bismuth, X-ray shown in (Fig. 2) was taken. From then on the patient became acutely ill

again, developing pain in the chest and right abdomen. The patient was then referred to the Ruptured and Crippled Hospital, with the view of having an operation on the focus about the cervical vertebrae.

On August 15, 1927, the patient was admitted to the Third Surgical Division under my care and at the time presented a striking picture.—He was acutely ill with a temperature of 103°, pulse 100 and respiration 24, and all evidences of a chronic infection, supra-imposed, such as emaciation (102 pounds, although 6 feet 1 inch tall), clubbing of fingers and contractions of the joints. He complained of throbbing pain about the right shoulder and liver region. There was a slight non-productive cough.

Examination at this time revealed a slight lateral deformity of the neck and a small sinus with slight discharge in the neck above the left clavicle. A probe was inserted and the end came in contact with bone. There was no sign of abscess in this region. There was a large healed scar in the left lumbar region, which was the result of a

POSTERIOR MEDIASTINAL ABSCESS

primary suppuration. To observation the examination was otherwise negative, except for slight contractions about the joints and the clubbing of fingers as described before. Thorough examination of all regions was negative except for the thorax.

X-rays of all bones and joints showed no pathology except the cervical region (Fig. 1), in which is shown the loss of substance between the involved vertebra. The bone destruction and bone production is pathognomonic of a previous pyogenic process.

Laboratory examination revealed a blood count as follows: Hemoglobin, 71 per cent.; red blood-cells, 4,160,000; white blood-cells, 11,200; polymorphonuclears, 69 per cent.; lymphocytes, 28; transitionals, 3 per cent. There was no anisocytosis or poikilocytosis. Blood culture proved to be negative. The urine was normal except for a slight trace of albumen. There were no organisms in the urine.

The thorax seemed to be the seat of pathology but presented an extremely difficult picture to interpret in a case which had been ill so long. The chest was well formed and there was no asymmetry. Expansion on both sides was good. To percussion the heart dulness was increased outward. The anterior chest was resonant. There was dulness to each side of the vertebral column for about 6 cm. laterally, pear-shaped, and extending from the third dorsal vertebrae to the eighth dorsal vertebrae. The liver dulness was markedly increased both upward and downward. Auscultation showed the heart sounds regular and forceful. There were no signs of consolidation in the chest by breath sounds.

X-ray of chest (Fig. 3) showed no collapse of the lung or consolidation, but the shadow behind the sternum was increased. The heart was pushed to the left. The diaphragm was elevated on the right but the costo-diaphragmatic angle was not obliterated.

At this time Dr. J. Ralph Scott was called in consultation and the physical examination of the thorax by Doctor Birrell, Reading and myself, was verified. Chest aspiration in mid-axillar line on both sides was negative, except for a small amount of fluid, which to cell count was normal and to bacterial culture was negative. We assumed at this point that there was a definite pathology in the mediastinum but still the pain in the liver region, slight tenderness and elevation of the diaphragm certainly pointed indefinitely to a subphrenic abscess. A long, fine needle was thrust into the area of dulness, posterior on the right side of the chest between the sixth and seventh ribs, close



FIG. 5.—X-ray of cervical region, ten weeks after operation, showing marked attempt at consolidation of fifth and sixth vertebra with new bone production.

to the vertebral column. The mediastinum was entered and purulent material withdrawn which revealed culture of *Staphylococcus albus*.

Tentative Diagnosis.—Abscess of posterior mediastinum which had gravitated from suppurative process in the neck following injection of cervical sinus with bismuth; but a subphrenic abscess, origin of which either by direct extension or metastatic, had to be also considered.

Operation.—September 2, 1927, under local anæsthesia, about five inches of the seventh rib on the right side was resected close to the spinal column. The pleura at this point was œdematous and slightly thickened. The pleural cavity was accidentally broken into but revealed the lung not collapsed and free from fluid. By careful dissection the posterior mediastinum was opened, which brought forth about one litre of purulent fluid. Rubber dam drains were inserted in the wound leading to the mediastinum and also the right pleural cavity was drained, because I felt, due to the already diseased and injured pleura, it would become secondarily infected and thus necessitate a second operation.

The patient stood the operation well, and on the third day his temperature became normal and remained so. The throbbing pain in the chest disappeared and to our surprise the symptoms about the liver region vanished. The wounds drained profusely at first, but by the fourteenth day post-operative, all drainage had subsided and tubes were left out of the wound. The sinus in the neck immediately healed. The wound in the chest healed completely on the thirty-fifth day. At this time X-ray of the chest (Fig. 4) showed a striking comparison with previous chest picture (Fig. 3). X-ray of the cervical region (Fig. 5) shows the healing process about the involved vertebra with very little deformity.

The problem at this time with the patient was to restore his muscular system to normal, which after a year's illness is no small matter to cope with and is almost as serious as the original ailment. Three weeks following the drop of temperature the patient was daily subjected to phototherapy with minute doses until the whole body could be exposed. The legs and arms were gently massaged, while the flexion deformity of the joints were daily stretched and passive motion given. He was able to walk with assistance on the fiftieth day, post-operative, and discharged without any symptoms on the seventy-ninth day, having gained fifty-six pounds since admission.

At the last examination, December 22, 1927, the chest was resonant throughout and the muscular system normal. He was able to walk three to five miles without fatigue and had returned to work in his office.

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ACUTE SUBPECTORAL ABSCESS

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ACUTE inflammations beneath the pectoral muscles may be observed, as elsewhere in the body, under a variety of circumstances. Were it not for the fact that their anatomical location endows them with certain diagnostic difficulties and prognostic consequences of a serious nature, they would be entitled to no special consideration. However, occurring, so to speak, at the crossroads between the arm, the neck and the thoracic cavity, they acquire a significance much greater than the literature devoted to them would indicate. Since the presentation of two excellent articles by Crouzet³ and Musser,⁸ little beyond the report of isolated cases has appeared upon this subject. In the American literature of the past twenty years, relatively few instances of this type of abscess formation have been reported. It may be that the condition is of rather infrequent occurrence. Thus, in a series of 1080 consecutive cases of inflammatory disease occurring at the Eppendorfer Krankenhaus in Hamburg, Kümmel is reported to have seen only twenty-six involving the subpectoral region. On the other hand, it must be considered as unusually singular, not to say fortunate, that within the space of a few years, five cases, three of them observed personally, should have come to my attention. Two of these present an etiology not previously described and all together give so good a resumé of the clinical picture of subpectoral abscess that they may justify a discussion of this interesting subject.

The term "subpectoral abscess" has been used, in its broadest sense, to describe any collection of pus found topographically beneath the pectoral muscles. Thus Crouzet has included in his classification both *supracostal* inflammations, occurring between the ribs and the pectoral muscles, and *infracostal* inflammations, occurring between the ribs and the parietal pleura. The inflammations of this latter category, admittedly rare, have been described by several authors under the more specific name of peripleuritis, infection of the space existing between the parietal pleura and the endothoracic fascia. Though I have been accorded the opportunity of examining a case of calcification of a traumatic peripleural hæmatoma, I have never seen a case of localized peripleuritis. From the observations recorded by Crouzet, Vogel and others, it appears that peripleuritis clinically resembles circumscribed areas of pleuritis for which it may easily be mistaken, rather than true subpectoral abscess formation. Occasionally, a peripleuritic abscess has been described as breaking through the endothoracic fascia and thus secondarily leading to the infection of the subpectoral space. However, this accident must obviously be considered as among the greatest of rarities and it would, therefore, seem more accurate to exclude this lesion from the category of subpectoral abscesses.

Strictly speaking, this designation should be limited to those collections of pus which are found in an anatomically delimited space lying between the pectoral muscles and the ribs to which the name subpectoral may be properly applied. The bacterial infections of this space may be chronic, due to the tubercle bacillus or acute, due to the common pyogenic organisms. Of the acute type, two varieties, a mild, circumscribed and a fulminating diffuse, variety, have been observed and described by Tillaux.¹⁴ While either the

chronic or acute type of abscess might have been used as a paradigm, the latter has been chosen for the purpose of this communication because it brings into bolder outline the clinically different pictures determined by localization of the infection in anatomically differentiated parts of the larger subpectoral space.

In most text-books of anatomy, the subpectoral space as an entity has been accorded relatively little consideration. The major part of the author's attention has been focused upon a consideration of the axilla, which forms a part, indeed a large and important part, of the more extensive subpectoral space. Under the influence of Tillaux's interest in the

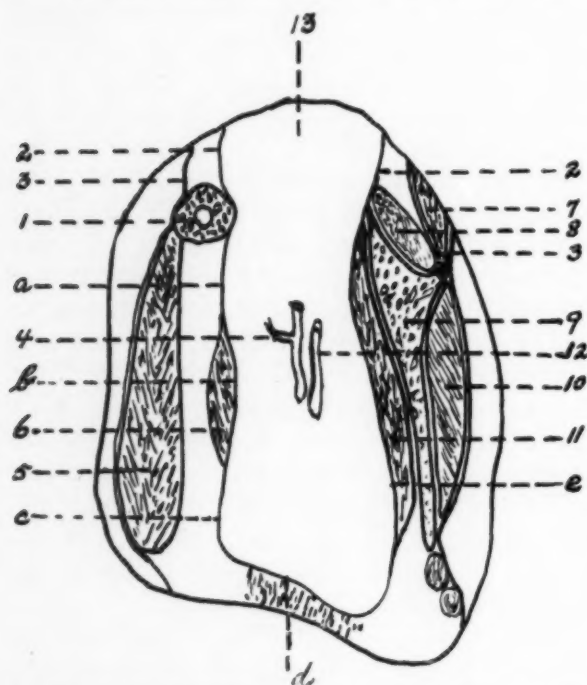


FIG. 1.—Sagittal section of the axilla, slightly internal to the coracoid process. (Moreau, loc. cit. p. 752). 1, Clavicle; 2, Middle cervical aponeurosis; 3, Superficial cervical aponeurosis; 4, Anterior thoracic vessels; 5, Pectoralis major; 6, Pectoralis minor; 7, Trapezius; 8, Supraspinatus; 9, Scapula; 10, Infraspinatus; 11, Subscapularis; 12, Axillary vein; 13, Cervico-axillary passage; a, Clavipectoral portion of fascia; b, Subpectoral portion of fascia; c, Infrapectoral fascia; d, Horizontal portion of fascia attached to skin; e, Subscapular fascia.

spread of subpectoral abscesses, Moreau⁷ made a special study of the limits of this region on a number of fresh cadavers. His conclusions in brief, may be summarized in somewhat the following manner. The subclavicular, subpectoral space is continuous through the cervico-axillary passage with a space formed above the clavicle in the neck by the reflections of the middle cervical fascia. As this fascia descends from the neck, it becomes attached in front to the sternum, the clavicle and the scapula, while behind it is attached to the first rib along its entire arc. Below the clavicle, portions of this fascia are designated by special names: scapular, infrapectoral, clavi-pectoral or axillary depending upon their topographical locations. This fascial arrangement defines a roughly pyramidal-shaped infra-clavicular space which may be called

ACUTE SUBPECTORAL ABSCESS

the *deep* subpectoral space and which extends from the sternum in front, through the axilla to the subscapular region behind. (Fig. 1.) Anteriorly it is covered by the pectoralis minor muscle, and the costocoracoid membrane, postero-externally by the scapular muscles, and postero-internally by the serratus. Below, it is closed by the axillary fascia while above it is open to give passage to the large vessels and is continuous with the fascial spaces of the neck. In this deep space, lie the main lymphatic glands draining the arm and the chest wall, as well as the large venous trunks of the arm. Suppuration occurring in any of these structures, the sequence of suppuration anywhere within the region of their distribution, may lead directly to infection of the deep pectoral space. From a realization of the extent of this deep space, the pointing of a deep subpectoral abscess either into the neck, into the axilla or into subscapular region posteriorly will be readily comprehensible.

The presence of the *superficial* subpectoral space is determined by the fact that the pectoralis minor muscle is enveloped in a separate dense fascial layer, which above fuses with the costocoracoid membrane and below becomes continuous with the axillary fascia. This excludes the space beneath the pectoralis major from continuity with the previously defined deep subpectoral space and gives rise to a space which on sagittal section is roughly triangular in shape. Above, this space is closed by the clavicle, below, it is open, except for the covering of the skin. Anteriorly, it is bounded by the pectoralis major, posteriorly by the pectoralis minor and the costocoracoid membrane, internally by the sternum and externally by the humerus. In addition to a group of small vessels and nerves, this space contains several of the pectoral group of lymph-glands which lie on the deep fascia along the lower border of the pectoralis minor muscle. These drain the pectoral and subaxillary portions of the chest, the outer part of the mammary gland as well as occasionally the skin from the region of the abdomen. Suppuration in these glands resulting from infections in the area drained by them may lead to abscess of this superficial space. Such abscess may point either outward to the skin at the lower border of the axilla or by following along the course of the pectoralis major, may appear in the space between the deltoid and the pectoralis major muscle.

This definition of a deep, subpectoralis minor space and a superficial, subpectoralis major space is not only of interest to the anatomist, but is also of the utmost importance to the clinician, inasmuch as it affords the anatomical basis for an understanding of the two different varieties of subpectoral abscess: viz.: the diffuse subpectoralis minor and the circumscribed subpectoralis major types. These types differ from one another in their anatomical location, in their clinical picture and in their prognostic consequences, as the following case histories may best illustrate.

CASE I.—*Subpectoralis minor abscess.*¹⁴ Male, aged twenty-nine, was admitted to the hospital, October 27, 1925, complaining of pain in the right shoulder region. He gave a history of having suffered from recurring osteomyelitis of various bones. At

the age of thirteen, he was treated for an osteomyelitis of the right os calcis. Six months later, he developed an osteomyelitis of the head of the right femur and a septic arthritis of the right hip. A month after this, large abscesses developed over each tibia which necessitated incision. No osteotomy was performed at this time, and the wounds healed slowly. For the next four years, the patient was apparently free of any acute osteomyelitic symptoms. Though constantly under observation and treatment, he was

able to do light work. Ten days before admission, the patient suddenly developed high fever and began to complain of pain in the region of the right shoulder. The slightest motion of the arm caused pain. His family physician applied cold wet dressings and a splint which apparently only served to increase the pain. A consultant, who saw the patient, made a diagnosis of pyarthrosis of the right shoulder and advised his removal to the hospital. On admission, the patient was obviously acutely ill. His temperature was 103.6° F., his pulse 120, and respiration 40. Except for the local condition, the physical findings were immaterial and of only historical interest. In the region of the right pectoral muscles, the skin was tense, hot, and of copper-colored hue. The whole anterior portion of the right chest was prominent, the swelling extending from the point of the shoulder well down to the nipple. The subclavicular space, well developed upon the left side, was completely obliterated on the right side.

Attempts at abduction of the



FIG. 2.—Röntgenogram showing osteomyelitis of coracoid process. No evidence of pyarthrosis

right arm brought a sharp pain response from the patient. The axilla was apparently free and not bulging. Tension made on the edge of the pectoralis major muscle caused increase of pain. At about the level of the right coracoid process, a slight but definite pulsation was seen. There were distinct signs of fluctuation. X-ray photograph showed a low-grade osteomyelitis of the coracoid process as well as of the axillary border of the scapula. (Fig. 2.) There was no evidence of a pyarthrosis. The Wassermann test was negative. The white count showed 11,800 leucocytes of which 78 per cent. were polymorphonuclears. Blood culture taken on this day was subsequently reported negative. The pectoral region was aspirated and a syringe of thick pus from which *Staphylococcus aureus* was later cultured was withdrawn. A tentative diagnosis of

ACUTE SUBPECTORAL ABSCESS

subpectoral abscess due to osteomyelitis of the coracoid process was made and the abscess immediately widely opened and drained. The abscess cavity was found to extend downward to the lower level of the axilla and upward over the shoulder to the supraspinatus fossa. With the finger, the exposed roughened bone of the coracoid process could be easily felt. Following operation, the patient appeared to be somewhat improved, though the temperature still remained high, varying between 102° and 104° F. As the subsequent course of events demonstrated, the patient was already suffering from a generalized pyæmia which ultimately resulted in his death. On November 6, the patient complained of pain in the left chest. The physical signs of pulmonary consolidation were elicited and were confirmed by the röntgenogram. On November 11, a crop of small skin pustules suddenly appeared over the whole body. Culture of the contents of several of these showed the presence of *Staphylococcus pyogenes aureus*. There was a marked enlargement of the submental glands and several days later a breaking down which necessitated incision. Culture of the pus obtained from these glands also showed *Staphylococcus pyogenes aureus*. On November 12, a large abscess developed over the right deltoid region. Wide incision showed that this cavity was continuous with the subpectoral cavity previously opened. The patient now began to develop metastatic abscess requiring incision all over the body. All showed the same organism, *Staphylococcus aureus*. December 3, a large abscess continuous with the subpectoral abscess was discovered and opened in the posterior axillary line. X-ray photographs showed an extension of the osteomyelitic process in the scapula as well as in the head and upper third of the humerus. In spite of the usual methods of treatment, in spite of blood transfusion and the use of autogenous vaccines, the patient gradually went downhill. On December 21, he complained of pain in the right chest and dyspnœa. A bed-side X-ray showed a consolidation of the right lung with effusion into the right pleural cavity. Culture of this fluid showed *Streptococcus hæmolyticus*. Blood culture taken at this time also showed 15 colonies of *Streptococcus hæmolyticus* per cubic centimetre. It was felt that this was probably a terminal infection since all previous cultures had shown *Staphylococcus aureus*. On the 26th, the patient died. Autopsy was not permitted. The history was filed under the following headings: chronic recurring osteomyelitis, osteomyelitis of the right coracoid process, with secondary right subpectoral abscess. Complications, *Staphylococcus aureus* pyæmia, multiple metastatic abscesses, terminal hæmolytic streptococcus septicæmia, broncho-pneumonia and acute fibrinous pleurisy with effusion.

It might be maintained, of course, that the development of subpectoral abscess in this case was merely the expression of an already existing pyæmia, rather than a sequel to osteomyelitis of the coracoid process. However, in view of the history of a chronically recurring osteomyelitis of long standing, of the definite evidence of advanced involvement of the coracoid process and of the appearance of the subpectoral abscess, some time before the manifestation of signs of generalized pyæmia, it is felt that the osteomyelitis of the coracoid process was antecedent to rather than coincident with the subpectoral abscess. In such event, the development of abscesses in the supraspinatus fossa, in the subscapular region, along the arm and the later appearance of metastatic abscesses throughout the body would be completely comprehensible on the basis of an understanding of the anatomy of the deep subpectoral space and of the serious prognostic consequences of infection in this region.

In another case to which reference is made only in passing because of the lack of any of the details, death resulted in an almost similar manner from infection of a finger with secondary involvement of the subpectoral space.

CASE II.—This case, from the private records of Dr. Walter M. Brickner, also belongs to the category of the subpectoralis minor abscesses. While it depicts the seriousness of the condition by the severity of the symptoms, it at the same time shows the value of early recognition of the condition and the institution of an adequate surgical treatment.

Mrs. L., age forty-six, was first seen December 26, 1916. She gave a history of having cut her right index finger on the previous day. The following day she had chills, a fever as high as 105° F. and was obviously acutely and seriously ill. She complained of severe pain in the region of the right shoulder. Motion of the arm was painful. There was a fulness in the right subpectoral region and pain on pressure. A diagnosis of deep axillary subpectoral abscess was made. This was incised, a large amount of pus evacuated and drainage instituted. No record of the bacteriological findings in the pus was made. The fever soon began to drop and within several days the patient was discharged cured.

The clinical picture of subpectoralis minor abscesses thus far sketchily depicted in the above recorded cases may be contrasted with that seen in the type of subpectoralis major abscess of which Case III is an example.¹⁵

CASE III.—Sarah S., aged sixteen, was admitted to the hospital, July 10, 1924, complaining of pain in the right pectoral region. There was no history of trauma or recent infection on the hand or on the abdominal wall. The patient was well developed and apparently not acutely ill. Motion of the right shoulder was painful. The subclavicular depression was obliterated but the axillary space retained its normal contours. The temperature was 100.6° F. In the right pectoral region there was a uniform, bulging of the chest wall. The skin over this area was slightly reddened and was tender to the touch and gave a suggestion of fluctuation deeper in the tissues. Any attempt to put the pectoral space under increased tension, either by grasping the edge of the pectoralis major or by abducting the shoulder, caused increased pain. Slight passive antero-posterior motions of the shoulder could be performed painlessly. This apparently indicated the absence of any intra-articular lesion in the shoulder-joint. A diagnosis of subpectoral abscess was made and under general anæsthesia, a two-inch incision was made over the pectoral muscle. On bluntly separating the fibres of the pectoralis major a large amount of creamy yellowish pus was evacuated. The pus came from beneath the pectoralis major muscle, but pointed anteriorly, and not down into the axilla. There was no apparent communication with the ribs, the clavicle, the humerus, or the shoulder-joint. A wet dressing was applied without draining. Within two days, the patient's temperature had dropped to normal. On July 14, the patient was discharged cured.

In Case IV the sequence of events is not entirely clear and the case is presented somewhat hesitantly because both operative and bacteriological data are wanting.¹⁶ Still it is of interest as indicating another possible origin for the development of subpectoral abscess which to the best of my knowledge has not previously been described.

CASE IV.—Male, aged twenty-one, came to the out-patient department complaining of pain in the region of the left shoulder. In January of 1925, he had been ill with pneumonia from which he apparently recovered without any complications. About one month after his recovery, he began to complain of pain in the left acromio-clavicular region. The pain though continuous, was not sufficient to interfere with his work. He noticed, however, that after especially strenuous work his shoulder became some-

ACUTE SUBPECTORAL ABSCESS

what stiff. About three months after the onset of the pain, he observed the appearance of a swelling in the left pectoral region which gradually increased in size. There was no history of chills or fever and venereal infection was denied. In the left pectoral region, extending from the clavicle down to the anterior axillary line there was a large, tense, fluctuating swelling, tender to the touch. The skin over it was warm and slightly oedematous, but not red. The subclavicular space was obliterated but the axilla was free. The axillary glands were somewhat enlarged. Abduction of the arm caused increased pain. It was felt that we were dealing with an abscess deep to the pectoral muscle and aspiration revealed the presence of a thick, creamy, yellowish pus beneath the pectoralis major muscle. On smear, there was numerous Gram-positive cocci, but culture of this pus remained sterile. The patient was referred to the hospital for



FIG. 3.—Röntgenogram showing probable abscess of the outer end of the clavicle.

operation. X-ray of the shoulder region showed "a gouged-out area at the acromial end of the clavicle which involves the medulla and cortex of this bone with the production of an extensive osteo-periostitis at the site of the lesion as well as in the entire shaft of the clavicle. There is an osteo-periostitis of the upper and outer aspect of the left humerus in the region of the cervical neck." (Fig. 3.) In an earlier X-ray this defect in the clavicle had been considered suggestive of a gumma. The blood Wassermann test, however, was negative. The blood contained 8700 white cells with 58 per cent. of polymorphonuclears per c.c. The temperature on admission was 98.8° F., respiration 20, pulse 72. Because of the patient's objection to operation and because of the apparent benignity of the infection, it was decided to treat the condition by repeated aspiration rather than by wide incision. Pus aspirated on several occasions showed neither the tubercle bacillus nor any other organism. Since this abscess was not widely opened and since no culture of the organism was ever obtained from this case, it was impossible to definitely establish the etiology or the mechanism of development of this abscess. However, because of the clinical appearance of the patient and the subsidence of symptoms after a period of only two weeks of treatment, it was believed that the patient had suffered from a subpectoral abscess secondary to an osteomyelitis of the outer end of the clavicle and he was discharged with that diagnosis.

In view of the inadequacy of the findings in this case, no too great weight must be given it. However, the development of pain in the region of the shoulder shortly after pneumonia, the appearance of an abscess in the subpectoral region and the demonstration of a definitely inflammatory loss of continuity in the outer end of the clavicle are interesting. Though these facts can by no means be considered as having any definitely established etiological relationship, they might be considered as suggesting a causal sequence of events, viz.: pneumonia, pneumococcic abscess of the clavicle with perforation and secondary infection of the subpectoralis major space. Both the attenuation of the bacteria and the localization of the infection might well account for the relatively innocuous clinical course.

Several different theories have been advanced in the explanation of the development of subpectoral abscesses. Musser⁸ considered trauma as the most common cause while Ashhurst¹ looks upon the infection of a hæmatoma consequent upon a trauma as the most likely origin of these abscesses. On the other hand, Tillaux¹⁴ is of the opinion that the majority of these abscesses are secondary to a lymphadenitis arising from some other focus of infection such as the finger. It has even been claimed by some that infections of the thumb and index finger are more apt to lead to subpectoral abscess formation because the lymphatic drainage from this area may reach the axillary nodes without interception in the epitrochlear glands. While the significance of an axillary lymphadenitis in the formation of these abscesses must be admitted, so definite a localization of the area of primary infection can by no means be accepted. Cases have been reported in which the focus was situated not on the thumb or index finger but elsewhere upon the hand, Pfeiffer,¹⁰ Riesman,¹² Rodelius,¹³ Davis,⁴ etc. Some authors have called attention to the fact that infection about the waist-line or even in the lung may occasionally lead to the breaking down of the antero-lateral or infero-lateral group of thoracic lymph-glands and thus secondarily to the formation of a subpectoral abscess. Renaut¹¹ described a case following an infection about the elbow and terminating by perforation into the lung, while others have described the formation of these abscesses secondarily to infections in the neck or in the pharynx.

Though these may be the more important of the different manners in which subpectoral abscess develop, they by no means exhaust the list of etiological mechanisms. Cases have been reported as due to furuncles of the axilla, hypodermic injections, splinters, or osteomyelitis of ribs. Others have been occasioned by grippe, pharyngeal anginas, otitis media or puerperal sepsis. Without attempting any too elaborate classification, it may make for clarity to consider subpectoral abscess as due to:

(1) *Penetrating injuries* where the infecting organism is actually introduced beneath the skin by splinters, hypodermic injections, hypodermoclysis, bullet wounds, stab wounds, aspiration of empyemata, etc., Henschen.⁵

(2) *Traumata* where as a result of a blow or of a sudden strain upon the pectoral muscles, a hæmatoma, i.e., a locus minoris resis-

ACUTE SUBPECTORAL ABSCESS

tentiae develops and becomes secondarily infected through the blood stream.

(3) *Lymphatic infection* where an infection upon the hand, the breast, or the abdomen, or a retro-grade lymphangitis from the mediastino-axillary glands may prove to be the point of origin.

(4) *Hæmatogenous infection* where a general systemic disease, such as grippe, puerperal sepsis, scarlet fever, typhoid fever, staphylo- or streptococæmia, etc., may lead to the formation of infected emboli.

(5) *Perforation of abscesses* in neighboring structures where, for example, furuncles of the axilla, typhoid abscess of the ribs, osteomyelitis of the clavicle or the coracoid process, purulent subacromial bursitis, pleural or pulmonary collections of pus, etc., Banks.²

The organisms most commonly found in cultures from subpectoral abscesses are, as might have been expected, the staphylococcus and the streptococcus. However, practically all of the other pyogenic bacteria have been reported. Among these are the gas bacillus, the pneumococcus, the typhoid bacillus, and a large number of the anaërobic bacteria. As compared with the strepto- and staphylococcus, these organisms are, however, of extreme rarity.

Clinically, subpectoral abscesses are of two varieties, the relatively benign subpectoralis major type and the relatively malignant subpectoralis minor type. The reason for this variation in the severity of their symptomatology was suggested earlier in the discussion of the anatomical configurations of the two spaces in which these abscesses develop. It was shown that the subminor space is of much greater dimensions than the submajor space and consequently offers a greater surface for absorption of toxins. It was shown further that because of their depth beneath the skin, there was relatively less a tendency for these later abscesses to point toward the skin and consequently a greater tendency for their spread along fascial planes into the neck, the back, along the arm and occasionally even through into the pleural cavity.

The subpectoralis major type is usually mild in onset. The patient complains of moderate pain in the pectoral region and motions of the arm cause a rather marked increase in the pain. There is a swelling in the pectoral region with obliteration of the subclavicular fossa. The skin over the swelling is red and cedematous. There is a slight rise in temperature and a moderate leucocytosis. But withal, the patient does not look desperately sick. If left to itself, the abscess usually tends to point toward the lower part of the anterior axillary fold.

The subpectoralis minor variety, on the other hand, is quite different. Its onset is usually sudden with chill, a sharp rise in temperature and a marked leucocytosis. The patient soon looks sick and septic. At first, but little may be seen locally and a mistaken diagnosis of rheumatism, pleurisy or sepsis is made. The patient complains of pain in the pectoral or shoulder region and motion of the arm is excruciatingly painful. Similarly, grasping

the edge of the pectoral muscle between the fingers causes an increase in tension and pain. As the abscess increases in size, the subclavicular fossa is obliterated but the axilla usually remains free. As the pectoral muscles are raised by the growth of the abscess, the skin becomes copper colored and œdematous. Because of the proximity of the axillary vessels, pulsation of this swelling is occasionally seen. The abscess may spread to the neck or the back or may even perforate into the pleura or the lung. General sepsis with the development of metastatic abscesses throughout the body is by no means unusual. In any case, the prognosis is grave, and if treatment is too long delayed may be fatal.

While in most instances, the diagnosis can be easily established, cases have been reported where even the most experienced have been led astray. In some, though the patient was obviously dying of sepsis, the diagnosis could not be definitely made until autopsy established the presence of a huge subpectoral abscess. As a consequence practically all who have written upon this subject have warned of the necessity of examining carefully for subpectoral abscess in all cases presenting the evidences of sepsis of undetermined origin. Frequently the physician's attention is focused upon the region of the shoulder by the appearance of pain on motion of the arm. The diagnoses of rheumatism, of purulent arthritis, of myositis, of subacromial bursitis, have been made, though they have been warranted neither by the clinical picture nor the röntgenologic findings. In such cases operations have often been deferred to the patient's detriment. In other cases where the appearance of a swelling has attracted the attention of the physician, early incision has been resorted to and tuberculous abscesses have been unnecessarily opened and subjected to the dangers of secondary infection by the pyogenic bacteria. Moreover, Ohlmann⁹ has called attention to the fact that in children suffering from severe types of pneumonia, an œdema of the chest wall simulating the swelling seen in subpectoral abscesses may occur and lead to unnecessary surgery. Other diseases of childhood, such as umbilical sepsis, cardiac decompensations, etc., may also simulate these abscesses. However, pain in the region of the shoulder made worse by grasping the pectoral muscle or by abducting the arm, the presence of fever, the history of a cut, abrasion, or any antecedent acute pyogenic infection, should in the presence of a sepsis of undetermined origin immediately suggest careful examination of the pectoral region.

Once the diagnosis has been definitely established, the only therapeutic measure is incision and drainage. This is best undertaken along the lower border of the pectoralis major muscle. In the superficially situated subpectoralis major type, as in Case III, simple incision even without drainage may be sufficient to result in cure. In the subpectoralis minor type, counter-incisions, posteriorly or in the neck, may be necessary to secure adequate drainage. In all cases, the urgent indication is for incision and drainage. In the mild case, early incision leads to rapid cure, in the severe type to hesitate is to be lost.

ACUTE SUBPECTORAL ABSCESS

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PULMONARY EMBOLISM

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IN THINKING of pulmonary embolism we are all too prone to consider it as something which is very rare, yet in nearly every community of any size there can be found laymen who can tell of some friend, who following some operation was doing nicely and suddenly died. It is natural to believe that a part of these, which in the past were called apoplectic strokes or cardiac failure, were in reality the blocking off of the major portion of one lung by a large embolus, which had broken away from its moorings, at its point of formation, and occluded one or both of the pulmonary arteries, or the major portion of their branches.

Vietor reports that at the New York Hospital from 1915 to 1924 in a series of 12,615 operations there were twenty-one cases of fatal pulmonary embolism. These occurring from sixteen hours to forty-seven days after operation, on an average of thirteen days. The average age of the patients being forty-three years.

Frischman reports one case of fatal pulmonary embolism in a woman fifty-five years of age with an epithelioma of the vulva, and treated only with radium and diathermy.

Rupp in performing 13,000 autopsies from 1903 to 1920 found a mortality rate of 1.1 per cent. from pulmonary embolism in internal disease, the average age of this series being fifty-two years. During the same period in 22,689 operations he found an incidence of .26 per cent.

Lindsay at the London Hospital reports ninety-six cases in a series of 31,426 operations from 1919 to 1924, an incidence of .3 per cent.

At the Peter Bent Brigham Hospital in Boston in 1920, Cutler and Hunt, in a series of 1604 operations, found sixty-three pulmonary complications of various kinds; of this number forty-three followed abdominal operations, thirty-two of these were lung infarcts as shown by X-ray and two were massive pulmonary embolism. Both cases of frank pulmonary embolism were fatal, while none of the cases of lung infarct were fatal.

In 1922, at the Johns Hopkins Hospital, Wharton and Pierson reported eleven cases of pulmonary embolism following 1600 gynæcological operations. An incidence of .68 per cent.

Heard, in reviewing the incidence of pulmonary embolism at the Mayo Clinic, in 125,164 operations from 1912 to 1920 found 104 cases of the massive type, an incidence of .08 per cent.

Wilson at the same clinic had previously reported 36 fatal cases in 57,000 operations, from 1899 to 1912, with a percentage of .063.

PULMONARY EMBOLISM

From personal experience in the Vanderbilt University Hospital, we add the following case reports:

CASE I.—J. R., a colored female adult, forty-eight years of age. She was admitted on the gynæcology service complaining of pain in lumbar spine during menstruation, and metrorrhagia for past nine months.

The physical examination was negative except for a large, hard nodular mass in pelvis which was fixed and not tender.

The operative procedure carried out was a supra-vaginal hysterectomy and a bilateral salpingo-oophorectomy. Spinal anæsthesia was used for the operation until it gave out and then ether was given. The uterus was twice its normal size and contained an intramural fibroid tumor the size of a guinea egg with a necrotic centre about the size of a quarter. Sections from which showed a leiomyosarcoma. On the left side of the uterus, and attached firmly to it and densely adhered in the cul-de-sac was an abscess a little larger than the uterus itself, involving both the tube and ovary, and made up of two cavities, one of which was ruptured in removal. The pus from the ruptured abscess had the odor of pus due to the colon bacillus.

On the second and third days post-operative the patient showed signs of peritonitis with abdominal distention, slight nausea and vomiting, temperature 101° F., and some increase in pulse and respiratory rates. All intake by mouth was stopped and fluids were given in other ways. On the fourth day after operation the patient was better and the symptoms of peritonitis were clearing up. On the fifth day she was decidedly better and was taking fluids by mouth with no nausea and wanted to eat. Then about noon she suddenly lost consciousness and the nurse was summoned by another patient in the room. In a few minutes she roused up enough to speak and then lapsed into unconsciousness again. Respirations were stertorous and sighing. She was pulseless and there were no audible heart sounds. She was given 1 c.c. of one to one thousand adrenalin chloride solution and two grains of caffeine by hypodermic, by the interne. The patient lived about twenty-five minutes from the time she first became unconscious.

Autopsy Findings.—The entire left lower extremity was swollen. There was some adherence between the coils of intestines, but the peritonitis seemed to be clearing up. There was a partial obstruction in the ileum, but no free fluid in the peritoneal cavity. There were no pleural adhesions, and no free fluid in the pleural cavities. There was a large fresh embolus filling completely the left pulmonary artery and extending down into the smaller branches. There were also large fresh emboli in the branches of the right pulmonary artery. Both lungs appeared bloodless and constricted as though the blood supply had been cut off completely. Just above the bifurcation of the left common iliac vein there was found a large friable thrombus. This thrombus extended down into the left internal iliac vein and into its various branches and even partially occluded the external iliac vein. The last 3 cm. of the left uterine vein was filled with a thrombus. The emboli in the pulmonary arteries had come from the thrombi in the left common iliac vein. The point of origin was probably in the left uterine vein.

CASE II.—H. W., a colored female adult, thirty-six years of age. She was admitted on the gynæcological service complaining of dysmenorrhœa and metrorrhagia for past six months. Her physical examination was negative except for a hard, nodular mass in the pelvis. The operative procedure carried out was a supra-vaginal hysterectomy and a prophylactic appendectomy. She was given a nitrous oxide and ether anæsthetic. Three days after operation she developed symptoms of intestinal obstruction and the incision was reopened. This time she was given a nitrous oxide anæsthetic. Loops of intestine were found matted together and adherent in the pelvis. These adhesions were broken up and the obstruction relieved. Six days later she complained of weakness, nausea, and had a rapid pulse. On the following day in addition to the above symptoms she complained of pain in the chest and there were venous pulsations in the neck. She developed air hunger, her blood-pressure was 90 mm. systolic and 60 mm. diastolic, respiratory rate

44 and pulse rate 100 with lungs clear. The veins in the neck and axilla were distended. Death occurred at 3.45 A.M. on the eighth day following the second operation and eleventh day following the first operation, and several hours after the onset of acute symptoms.

Autopsy Findings.—Many loops of intestine were bound together by fairly firm recent adhesions. There was dilatation in the lower part of the ileum, with the bowel collapsed below, showing probably a complete obstruction. There was found a gray rough embolus about 1 cm. in diameter and 4 or 5 cm. long riding the bifurcation and extending into each branch of the pulmonary artery. The embolus does not completely occlude either pulmonary artery and beyond the ends of the embolus can be seen more recent thrombi. The right common iliac vein was found to contain a gray, laminated thrombus which extended into the internal and external iliac veins, extending from the external iliac into the femoral vein where it terminated. A thrombus was also found in the uterine vein on this side, beginning at the point of ligation and extending out into the internal iliac, into the common iliac and thence in both directions. The pulmonary embolus evidently broke away from the thrombus in the common iliac vein. The left common iliac vein and its branches were free from thrombi.

CASE III.—A. K., a colored female adult, fifty-nine years of age. She was admitted on the gynecology service complaining of a swollen abdomen, continuous bloody vaginal discharge and shortness of breath. Her physical examination reveals marked dyspnea with no other chest findings. An enormously distended abdomen with dullness on percussion over the lower portion and in both flanks. On palpation a hard nodular mass could be felt through the abdominal wall. There was a sanguino-purulent vaginal discharge.

Two days after admission a paracentesis was done and 3300 c.c. of bloody fluid was removed. Seven days later an exploratory laparotomy was done under local anesthesia. Three thousand c.c. of bloody ascitic fluid was removed. Finding a large fibromyoma which was degenerating and which it was impossible to remove, a biopsy was taken from the tumor and the incision promptly closed.

About twelve hours later (after using a bed pan) she became suddenly ill, began moaning and frothing at the mouth and died five minutes later. Artificial respiration was attempted by the interne but of no avail.

Autopsy Findings.—The abdomen was tremendously distended, and contained about 800 c.c. of blood-tinged fluid. There was a pelvic tumor mass extending well into the abdomen, the surface of which was nodular, smooth, lobulated and partially covered with blood. The uterus, tubes, ovaries and bladder could not be differentiated, and the terminal portion of the ileum, the cecum and ascending colon, the sigmoid and rectum and isolated loops of small intestine are all matted into the tumor mass. The pulmonary arteries contained large thrombi which had separated themselves into layers, so that the cells were at one end and the clear serum portion was at the other. This was explained by our pathologist as being a post-mortem clot and due to gravity, the heavier formed elements in the blood had settled to the bottom. No cause was found for sudden death.

CASE IV.—F. C., a colored female adult, forty years of age. She was admitted on the gynecology service complaining of frequency of urination and menorrhagia for past year. She was told by a doctor that she had a tumor two years ago.

Her physical examination was negative except for a large hard nodular mass in the lower abdomen.

The operative procedure carried out was a supra-vaginal hysterectomy, bilateral salpingectomy, and a prophylactic appendectomy. The operation was begun under spinal anesthesia and finished with ether. The next day following operation the patient was complaining of a burning pain in the epigastrium. The second day after operation she was slightly nauseated. On the third day she was considerably nauseated and abdomen was slightly distended, but her temperature was normal. On the fourth day the symptoms were the same but were more pronounced and a gastric lavage was done because

PULMONARY EMBOLISM

of vomiting. On the fifth day examination of her chest revealed no pathology, her blood pressure was 150 mm. systolic and 90 mm. diastolic. Another gastric lavage was done and quite a lot of highly colored material was removed. The abdomen was now quite distended. About 6 P.M. her nurse went to dinner and on returning found the patient in an extreme condition. When I was called I found the patient unconscious, her extremities were cold, she was pulseless, and I was unable to elicit any heart sounds. She had three or four sighing shallow respirations and died. I was unable to obtain an autopsy, but the patient very likely died of pulmonary embolism, as the clinical findings point in this direction.

CASE V.—Mrs. V. W., a white female adult, forty years of age. She was admitted on the obstetrical service complaining of vaginal bleeding for past four and a half months. Her physical examination was negative except for a pregnancy of five months and a marked secondary anemia with a hæmoglobin of only 30 per cent. and a red blood-cell count of 1,580,000. A diagnosis of placenta prævia of the lateral type was made.

The next day after admission the amniotic membranes were ruptured. This failing to induce labor the following morning (about twenty hours later), a Voorhees bag was inserted in the cervix. The cervix was quite fibrous from tears during previous deliveries and dilatation was very slow. About forty-five hours after introduction the bag was expelled together with a five months' fœtus (which had been dead a short while) and all of the secundines. There was very little bleeding at this time. Following her delivery the patient refused to have a blood transfusion. The next day she was showing signs of puerperal sepsis, but still refused a transfusion. On the second day post-partum she was given 300 c.c. of whole blood, which raised her hæmoglobin to 55 per cent. On the tenth day post-partum she was given a second transfusion of 500 c.c. of whole blood. On the seventeenth day post-partum she was given 400 c.c. of citrated blood. During the puerperium two positive blood cultures were obtained. The offending organism being an anaërobic non-hæmolytic Gram-positive streptococcus. Patient had nausea, vomiting and abdominal distention for two days before death, and both lower extremities had been swollen for a period of three or four days.

Autopsy Findings.—Both lower extremities swollen. The peritoneal cavity was filled with a cloudy amber-colored fluid containing a number of fibrin flakes and some of the loops of intestine were held together by fibrin. Both lungs show small reddish patches scattered throughout lower lobes. This was a broncho-pneumonia which appeared to be embolic. The uterus showed quite a degree of sub-involution. The endometrium was ulcerated and necrotic. Both tubes were acutely inflamed. The uterine and ovarian veins were thrombosed and filled with a purulent exudate and there were large thrombi in both external iliac veins.

The cause of death in this case was septicæmia, generalized peritonitis and pneumonia. However, the iliac veins being thrombosed to the extent of causing a considerable degree of œdema in the lower extremities. It was only a matter of time until emboli would have been dislodged and sent on an excursion of death into the lungs.

CASE VI.—E. J., a white female adult, twenty-two years of age. This case was admitted on the surgical service complaining of pain and swelling of left thigh and inguinal region for past three days.

The physical examination was negative except for a large area of swelling below Poupart's ligament on the left and extending toward the medial surface of the thigh. This area was slightly indurated and extremely painful and tender. Three days after admission she was given a nitrous oxide anæsthetic and this area on the left thigh incised. Two days post-operative she was given mercurochrome intravenously, followed by a transfusion of whole blood. On the fifth day after operation she became comatose and died. Our pathologist gave as the cause of death a streptococcus cellulitis of the left thigh. She also had thrombi in the left external iliac vein which completely obliterated its lumen, and infarction of the right lung plugging the descending branch of the right pulmonary artery and completely occluding its lumen.

CASE VII.—C. R., a colored male adult, fifty-five years of age. This case was admitted on the medical service. The chief diagnoses were hypertension, cardiac insufficiency, and auricular fibrillation. He was under treatment for four weeks before death. His blood-pressure on admission was 160 mm. systolic and 88 mm. diastolic. For a few days before death his blood-pressure was 70 mm. systolic and 45 mm. diastolic. There was a considerable degree of generalized œdema, his respirations were shallow, but no râles in lungs.

Autopsy Findings.—His chief cause of death was given as mural thrombi in the right ventricle. There was also found an embolus in the lower branch of the left pulmonary artery. The infarct was in the upper portion of the lower left lobe. The lung tissue surrounding the infarcted area was markedly congested. The infarct was about 2 cm. in diameter and contained a small abscess showing that the embolus was infected as the abscess was inside the infarct. There were no emboli in the branches of the right pulmonary artery.

CASE VIII.—J. W. B., a white male adult, sixty-eight years of age, was admitted on the medical service and a clinical diagnosis of chronic myocarditis, cardiac insufficiency and partial heart block was made. The patient was under treatment for nearly three months before death.

Autopsy findings were multiple mural thrombi in the left ventricle and right auricular appendage with necrosis of myocardium of left ventricle. In the lower portion of the upper lobe of the right lung was a large firm area, which was dark red in color and greatly congested. On section the infarcted vessels were readily demonstrated. The apex of this lobe was soft and crepitant. There were no areas of infarction in the left lung.

Etiologic Factors.—The average time for pulmonary embolism to occur, as given by various writers, following an operation is ten days. It may occur in a few hours and even after a period of weeks. The patients in this series who died of pulmonary embolism ranging from four to eleven days. It usually occurs at some such time after the patient has become a little more active and by exertion has dislodged the thrombus which becomes the offending agent.

In this series of cases of pulmonary embolism of both small and massive types the average age is forty-six years. That the great majority occur in patients who are past middle life there can be no doubt. Closely associated with the age of the patient is the condition of the patient, and the slowing of the blood stream or venous stasis. Here, too, may be considered the kind and length of anæsthetic, but Cutler and Hunt in their series have found pulmonary embolism just as frequently following a local anæsthetic as when the anæsthetic was general. Likewise Mann, at the Mayo Clinic, in experimenting with dogs found no difference in the rate of incidence when he injected artificially formed emboli into the blood stream of dogs who were healthy, diseased or when weakened by a prolonged ether anæsthetic. That any patient is weakened and has a certain amount of depression of the circulatory system by a general anæsthetic there can be no doubt, but when they occur just as frequently following a local or spinal anæsthetic, it makes us think that the form of anæsthesia is only a very minor part among the etiologic factors. That the lowering of the blood-pressure may be a contributory factor has been suggested and is borne out by one of the cases here reported, but on the other hand another of the more outstanding cases in this series

PULMONARY EMBOLISM

had a blood-pressure of 150 mm. systolic and 90 mm. diastolic only two hours before death. Here again we cannot be sure of this point because this same patient's blood-pressure may have been lower previous to this time, and had been stimulated only to break loose a thrombus and send it on an errand of death. As we consider the state of the blood as an etiologic factor, we come to the question of fluid content. That a patient who has been operated and who is suffering from nausea, vomiting, distention and the various symptoms referable to the abdomen will become dehydrated we all know. That one of the first tissues to suffer from dehydration is the blood we are reasonably sure. The consideration of the body fluids brings us next to acidosis as the principle contributors to acidosis, are lack of fluid intake and carbohydrate starvation. Then we see that acidosis while perhaps a contributing factor is entirely secondary to other causes.

Chilling and cold have been suggested as one of the etiologic factors, but in a well-conducted clinic it of course should at least be only a negligible quantity.

After having two parturients to die on the same day from pulmonary embolism, De Snoo suggests that they were due to bacteria of a special thrombosis inducing type. He also cites that of twelve fatal cases out of 10,000 deliveries eleven came from the pelvic veins and all of those developing pulmonary embolus had been delivered artificially. W. J. Mayo states that minute septic emboli from the operative field are a common cause of secondary pulmonary complications. Case seven in this series further bears out the fact that infarcts are due to septic emboli and may give rise to lung abscesses or broncho-pneumonia. On the other hand, when we look at the great number of cases of pulmonary embolism following some operative procedure, especially in gynæcological operations, in which there cannot be demonstrated any infection, again we feel that this too is not the principle cause.

In operating case one in this series to free an abscess of this size, quite a lot of trauma can easily be caused if we once forget to take care, when the abscess was freed there remained quite a large area of bleeding surface. To control this sponges were applied with some pressure. This further bears out both the idea of sepsis and that of trauma as there was septic material turned loose and considerable trauma done.

Rupp in his series of autopsies found the original site of the thrombus to be in the pelvic veins in 42 per cent. of the cases. Hampton and Wharton go still further and report an incidence of the offending thrombus arising in the pelvic veins in 85 per cent. of their cases. That this should be true there must be some definite reason. We know that of all operative procedures gynæcological operations head the list. Thrombi are more frequently formed in the left common iliac vein or one of its branches, which seems to be contributed to by the fact that it passes under the left common iliac artery. Therefore it seems that anatomical faults associated with septic material and undue operative trauma are the principle factors in leading to thrombosis in

the pelvic veins. Two of the most striking cases in this series were being kept on back rests with knees elevated as a prophylactic for the prevention of pneumonia, with the pelvis as the most dependent part of the body. That this should lead to venous stasis in the veins of this area, in a patient whose circulation is already at a low ebb is only reasonable to believe. Added to this may be considered abdominal distention with its associated increase in intra-abdominal pressure with consequent slowing up of the venous return as was present in four of the cases here reported.

Symptomatology.—Lung infarcts of the small type may go unnoticed. When they give rise to symptoms there is a sudden localized pain, especially if the infarcted area reaches the pleura, and in this case there will be a definite area of consolidation of lung tissue with an associated pleural friction rub. There may or may not be a chill. The sputum if any will be frothy and may be blood tinged. There will be a moderate elevation of temperature with a moderate leucocytosis. If the embolus was not infective the condition will clear in a few days, but if it carries infective material it may lead to pneumonia, gangrene or a lung abscess. When embolism of the massive type occurs it gives rise to such pronounced symptoms, that when this picture is once seen it can never be forgotten. To have a case feeling fine and apparently doing as well and find her in a state of shock, unconscious, dyspnoic, cyanotic, low blood-pressure, weak pulse or even pulseless, frothing at the mouth and perhaps a degree of hæmoptysis is quite an appalling sight.

Treatment.—The best treatment for pulmonary embolism is prevention. If it can be demonstrated that a patient has an embolus at some point in the peripheral circulation, it may be successfully removed, and in cases of thrombophlebitis an intravenous injection of mercurochrome may be given. Although mercurochrome is overestimated, I believe it is definitely beneficial in thrombophlebitis, and I have had very good results in its use in these cases.

Trendelenburg has successfully operated upon pulmonary embolism in animals, but as yet there is no authentic case of successful removal in the human.

In two of our cases the interne administered cardiac stimulants. Nothing could be more harmful. After the major portion of the pulmonary arteries or their branches have been occluded, any stimulation of heart action with its concomitant increase in blood-pressure would only drive the emboli into the vessels tighter and would probably lead to dilatation of the right heart. So we see that once the condition has arisen there is no satisfactory treatment.

CONCLUSIONS

1. Pulmonary embolism occurs usually in patients who are past middle life.
2. It occurs just as often in internal disease as following an operation.
3. It is more frequent following gynæcological operations than any other procedure.

PULMONARY EMBOLISM

4. Lung infarcts are never fatal unless septic, whereas emboli of the massive type are always fatal.

5. The principle etiologic factors in the production of thrombi are operative trauma, septic material, low blood-pressure with venous stasis, dehydration, anatomical arrangement of pelvic veins and an inforced recumbent posture for several days with perhaps some abdominal distention and its associated increase in pressure with consequent slowing up of the venous return.

6. It occurs just as often with local or spinal anæsthesia as when ether or gas is used.

7. The massive type is inevitably fatal, while the smaller ones are never fatal.

8. The principal symptoms of lung infarcts are localized pain, frothy sputum with at times a tinge of blood, moderate temperature and leucocytosis and a pleural friction rub.

9. The symptoms of the massive type are shock, dyspnœa, cyanosis, low blood-pressure and weak pulse, and unconsciousness.

10. The best treatment is prevention.

HARELIP AND CLEFT-PALATE*

A STUDY OF FOUR HUNDRED AND TWENTY-FIVE CONSECUTIVE CASES

By WARREN B. DAVIS, M.D.

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THE four hundred and twenty-five cases in this series include the various types of harelip and cleft-palate deformities which have been under my care

from January 1, 1914, to November 1, 1927. I am indebted to Dr. J. Chalmers DaCosta for the opportunity of caring for all harelip and cleft-palate cases admitted to "Surgical Division A" at the Jefferson Hospital since 1915, which cases constitute nearly one-half of this series. The other cases were those on my service at the Philadelphia General Hospital from 1915 to 1920, those at the Frankford Hospital since 1922 (for which I thank Dr. Charles F. Nassau), and my private cases.

Fifty-six per cent. of the cases were males and forty-four per cent. females. The age of the patients at the time of first examination varied from one day to seventy-six years. Sixty-three per cent. of the cases were under seven months old. The types of the deformities, the number and the percentage of each type are shown in Table I.

Etiologic considerations show that heredity is a dominant factor, positive family histories being obtained in fifty-seven per cent. of our cases. The percentage doubtless would have been considerably greater if the knowledge of the family histories had been more extensive and accurate. In many cases our information was limited to only one or two generations. By positive history we mean not only the occurrence of actual clefts of lip or palate of some degree in some other member or members of the family within three generations, but also the congenital absence of one or both of the permanent superior lateral incisor teeth in some of the relatives. In

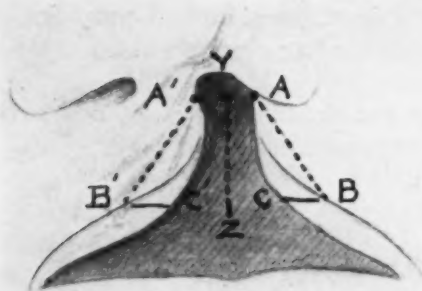


FIG. 1.—Semidiagrammatic sketch, showing lines of incisions used for the correction of unilateral harelip after the method of J. E. Thompson. Sharp pointed calipers are used in measuring the distance YZ from the midpoint of the floor of the nostril being constructed to the point in the same sagittal plane to which the free margin of the lip would come if it were of normal contour. Fixing the distance on the calipers and keeping the superior point at Y, the inferior point of the calipers is rotated describing an arc which crosses the vermilion border of the lip on either side of the cleft. These points B and B' are distinctly marked by making a puncture with the point of the calipers or with a small scalpel. Points C and C' are then located on the free margin of the lips so that the angles ABC and A'B'C are between 70 and 80 degrees. Incisions carried through the entire thickness of the lip with a small scalpel at a right angle to the skin surface and following the lines as outlined will give surfaces for approximation which are of equal length and which, when sutured together, will give a lip the length of which is the estimated normal length YZ plus the distance from the vermilion border to the free edge of the lip CB which is usually just sufficient to allow for subsequent contraction.

* Read before the Philadelphia Academy of Surgery, December 5, 1927.

HARELIP AND CLEFT-PALATE



FIG. 2.—Case I. B. W., child, age seven months, with incomplete unilateral harelip. Note the absence of muscle tissue between the superior angle of cleft and floor of the nostril, deviation of the nasal septum, and flattening of the ala.



FIG. 3.—Case I. B. W., ten months after operation, showing contour of lip and nostril. The incisions used in this case were those of the Thompson method, carrying the incisions up into the floor of the nostril, removing sufficient tissue to allow the proper approximation of the ala to the septum after freeing the lateral portion of the lip and the anterior portion of the cheek from the maxilla.

eighteen cases we have found this relationship existing between absent lateral incisor teeth in one generation and the presence of harelip or cleft-palate, or both, in a succeeding generation. In four instances the absence of the lateral incisor teeth occurred in a parent, in five instances in an uncle or aunt, and in nine instances in first or second cousins of the patient. We have been greatly interested in this tendency which we believe has not been previously pointed out. In the cases with a negative history for actual clefts we are now requesting the parents to coöperate in searching for relatives showing congenital absence of the lateral incisor teeth. We have not been able to prove syphilis an etiologic factor in any case. Race has some bearing—only one of our cases being a negro. Only six per cent. of the cases were Hebrews.



FIG. 4.—Semidiagrammatic sketch showing partial division of alveolar process posterior to the canine area on the right side to facilitate bringing premaxilla into normal position. A wire suture is used to hold the parts in apposition.

Other congenital defects which we found associated with harelip and cleft-palate deformities were supernumerary digits in four cases; deficiency in number of digits, one case; webbed fingers, one case; club-foot, one case; spina bifida, one case; hernia, eight cases; deficient development of mandible associated with microglossia, two cases; mongolian idiocy, one case; idiocy, three cases; distinctly defective mentality of less degree than idiocy, five cases.

The great value of the splendid coöperation which we have had from the Pædiatric Department at Jefferson, and also at the Frankford Hospital, is fully appreciated. Many of the infants were sent to the hospital in a very

TABLE I.

Unilateral harelip (left)	34 cases or 8%
Unilateral harelip (right)	21 cases or 4.94 + %
Bilateral harelip	13 cases or 3.05 + %
Median harelip	2 cases or 0.47 + %
Unilateral harelip and cleft-palate (left)	132 cases or 31.05 + %
Unilateral harelip and cleft-palate (right)	26 cases or 6.11 + %
Unilateral harelip and bilateral cleft-palate	8 cases or 1.88 + %
Bilateral harelip and unilateral cleft-palate	6 cases or 1.41 + %
Bilateral harelip and bilateral cleft-palate	55 cases or 12.94 + %
Unilateral cleft-palate extending into hard palate, without lip deformity	9 cases or 2.11 + %
Bilateral cleft-palate extending into hard palate, without lip deformity	85 cases or 20%
Cleft involving soft palate only	34 cases or 8%

HARELIP AND CLEFT-PALATE



Fig. 5.—Case II. R. M., age seventeen months, showing complete unilateral harelip and cleft-palate. Note rotation of premaxilla and flattening of the nostril.



Fig. 6.—Case II. R. M., showing contour of lip and nostril six months after operation. Alveolar process was partially divided lateral to the left canine area to allow the premaxilla to be forced into approximately normal position, as shown in Fig. 4. This procedure also corrected the marked deviation of the nasal septum. Incisions for the lip were outlined by the Thompson method.



FIG. 7.—Case III. E. C., age ten weeks, showing an unusual, wide and extensive unilateral cleft of lip and palate in which the bony cleft extended into the floor of the orbit. The alveolar process was approximated and the lip reconstructed at the first operation.



FIG. 8.—Case III. E. C., showing contour of the lip and nostril, eight months after operation. Fourteen months after the first operation a second operation was done to correct the deformity of the right nostril. This was done by detaching the ala laterally and along the mid portion of the right nasal bone allowing the ala to swing into normal position as a pedicled flap where it was sutured with an inner and outer row of interrupted black silk sutures. The area over the nasal bone from which the superior portion of the flap was removed was allowed to heal by granulation. Vaseline dressings were used. The area healed so rapidly that skin grafting was not deemed necessary.

HARELIP AND CLEFT-PALATE



FIG. 9.—Case III. E. C., appearance of lip and nostril five months after second operation.



FIG. 10.—Case IV. M. M., age two months, eight days, showing complete unilateral cleft of lip and palate left side, incomplete harelip right side. Alveolar process was partially divided lateral to the right canine area allowing premaxilla to be forced into normal position where it was held with silver wire. The left side of the lip was repaired at the same operation.



FIG. 11.—Case IV. M. M., showing the condition of the lip and nostril four weeks after the first operation. At the second operation the right side of the lip was repaired. Care was taken in both operations to preserve the entire philtrum. (Fig. 20.)



FIG. 12.—Case IV. M. M., showing appearance of lip and nostril seven months after second operation. Note that the philtrum has developed until it is now of approximately normal length and the contour of the lip is almost normal.

HARELIP AND CLEFT-PALATE



FIG. 13.—Case V. T. H., age five months, complete bilateral harelip and cleft-palate showing moderate anterior rotation of premaxilla. Note the presence of mucous pits on the lower lip which are rather rare, having been present in only three instances in 425 cases. The premaxilla was replaced as outlined in Figs. 18 and 19. The lip was repaired by the method illustrated in Fig. 20.



FIG. 14.—Case V. T. H., showing the appearance of lip and nostrils twenty-two months after the first operation. The bilateral cleft-palate was repaired twelve months after the first operation. The slight amount of excess tissue at the free margins of the lip on the left side will be removed later as was done in Case VI, Fig. 16.



FIG. 15.—Case VI. C. G., age four months, bilateral harelip and cleft-palate. Displacement of the premaxilla was not marked in this case. Nearly the entire philtrum was utilized in the repair of the lip. The incisions were outlined as in Fig. 20.



FIG. 16.—Case V. C. G., showing the appearance of lip and nostril five months after operation. The cleft in the palate was closed at this time. Eight months later the excess fullness of the lip lateral to the philtrum was corrected by removing a small amount of tissue from the postero-internal surface of the lip on each side.

HARELIP AND CLEFT-PALATE

poor state of nutrition and required much paediatric care before their general condition would permit operative measures.

In nine cases of bilateral cleft-palate the development of the horizontal processes of the palate was so very rudimentary that operative measures were deemed inadvisable. In such cases dental plates supported by some of the teeth are used. Eleven cases included in this series are not yet in condition for operation. Twelve infants, who were never operated upon, died from nutritional disorders or respiratory infections. Thus three hundred and ninety-three cases have been operated upon, the number of operations required on each varying from one to four, according to the type of the deformity. The surgical mortality was as follows: One case died on the operating table shortly after the administration of ether was begun and before any incision was made. Post-mortem examination showed an enlarged thymus and general lymphatism. Three died within twenty-four hours after operation from shock and pulmonary œdema. Four died after the twenty-



FIG. 17.—Case VI. C. G., showing appearance of lip and nostril fourteen months after the first operation on the lip and one month after second operation.

four-hour period and within six weeks, from pneumonia. A total of eight deaths or a two per cent. surgical mortality. One infant who died three weeks after operation from impetigo contagiosa bullosa (contracted in the ward one week after operation) is not included as a surgical mortality.

Careful observation of the ultimate conditions following the different types of operations shows that the best functional and cosmetic results were those obtained by the operative procedures, briefly outlined below, and described in the legends accompanying the illustrations.

Harelip deformities should be corrected as soon as the child is in condition to stand the operation—which is usually sometime between the tenth day and the third month. Incisions are outlined by the Thompson method. (Fig. 1.)

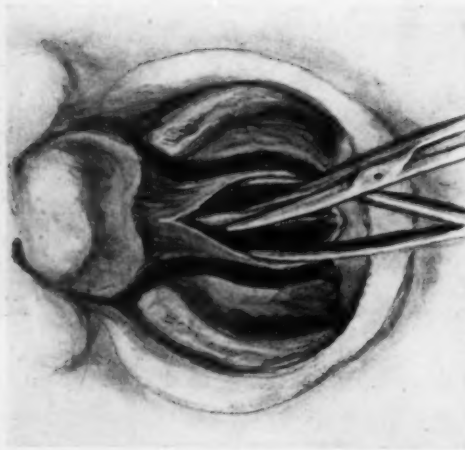


FIG. 18.—Sketch showing method of removing a section from the lower portion of the vomer and the anterior portion of the nasal cartilage. The removal of a triangular section of bone and cartilage allows infero-posterior rotation of the premaxilla to approximately its normal position. The length of the base of the triangular piece of bone and cartilage removed is determined by the amount of rotation which the premaxilla requires, and should be such that when the premaxilla comes into proper position the sides of the triangle will be brought together. There will be bulging of the mucoperiosteum at this point for several days, but the excess tissue soon resorbs.

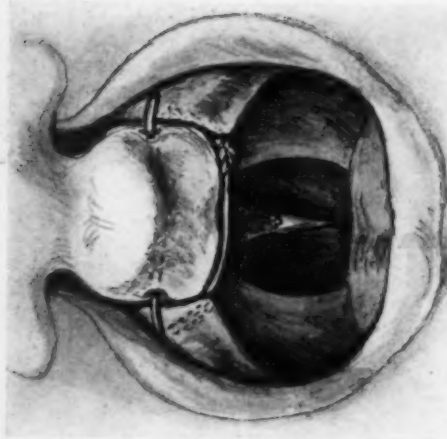


FIG. 19.—Lateral margins of the premaxilla and the margins of the alveolar process have had the mucosa removed from the points which will come in contact to allow approximation of the raw surfaces and permit fibrous union. The premaxilla is held into position by a wire suture which passes through the superior portion of the alveolar process on each side. It is carried in front of the premaxilla but posterior to the philtrum.

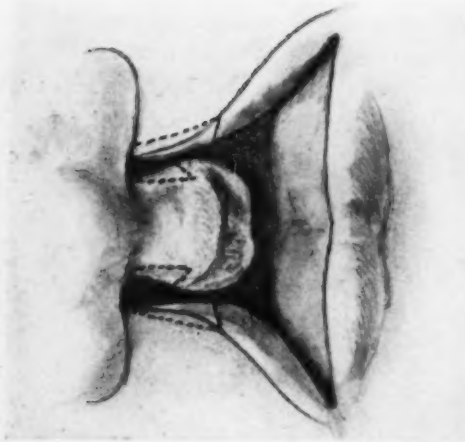


FIG. 20.—Sketch showing the approximate outlines for incisions which allow preservation of almost the entire philtrum in the closure of bilateral hare lip. Incisions along these lines are carried through the entire thickness of the lip and the philtrum. The alae are brought into proper relation to the septum after which the points of the free edges of the philtrum and the corresponding points on the lip are brought into accurate apposition using care that the vermilion border of the lateral portions of the lip and those of the philtrum are even. The lips shown in Figures 10, 13 and 15 were repaired by this method.

HARELIP AND CLEFT-PALATE



FIG. 21.—Case VII. B. D., age two months. Approximate three-quarter view from the right side showing a very unusual bilateral cleft of the face. The bilateral cleft involved the lip and the alveolar process, but the palate posterior to the premaxilla was united. The clefts in the lip do not extend into the nostrils as in an ordinary case but pass lateralward extending into the orbits. These clefts into the orbits involve the bony structures as well as the soft tissues. Note the extensive coloboma. The naso-lacrimal ducts do not communicate with the inferior nasal meatus but pass posterior to the premaxilla and open into the roof of the mouth. Examination of the eye grounds by Doctor Shannon showed the fundus of each eye apparently normal.



FIG. 23.—Case VII. B. D., Three-quarter view from the left side. Note that the opening of the anterior nares is approximately on the same level as the pupils of the eyes. The anterior nares, although small, were well formed. The posterior nares were also well formed, but midway between the anterior and the posterior nares there was complete obstruction on both sides formed by a transverse partition of soft tissue covered by mucous membrane.



FIG. 23.—Case VII. B. D.; one month after the first operation, at which time the premaxilla had been forced into as near the normal position as possible, the cheeks freed from the anterior surfaces of the maxilla, and brought medially and superiorly to form a floor for the orbit and to bring the lower eyelid medialward. Two operations were done after the stage shown in the above illustration for the further repair of the lip and the eyelids. A fourth operation was done to make an opening through the partition between the anterior and the posterior nares.



FIG. 24.—Case VII. B. D., showing condition of face three months after the first operation. Four operations were performed. The patient is to return in twelve months for further minor corrections.

HARELIP AND CLEFT-PALATE



FIG. 25.—Semidiagrammatic sketch showing unilateral cleft-palate and the outline of incisions (slight extension of the Langenbeck incision) used in loosening the mucoperiosteal flap on the side attached to the vomer and loosening the flap containing the rudimentary horizontal process of the maxilla and of palate bone on the opposite side. The latter incision is carried through the periosteum after which the horizontal processes are cut through with a very thin chisel.



FIG. 26.—Semidiagrammatic sketch showing mucoperiosteal flap loosened on the patient's right side and a flap containing bone on the patient's left side. In the two-stage operation tapes are passed around both flaps and tied so as to hold the medial margins of the flaps in apposition, or nearly so, care being taken not to exert sufficient pressure by the tapes to shut off circulation. Iodoform gauze packs are used in the lateral incisions for twenty-four hours.

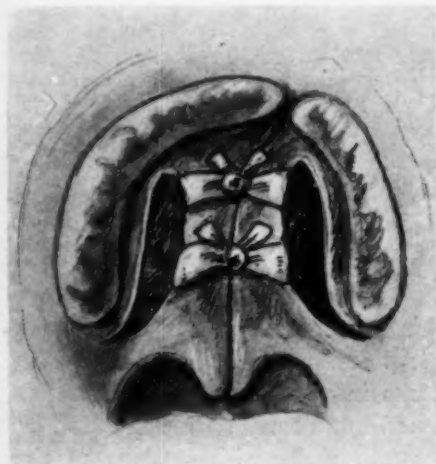


FIG. 27.—Semidiagrammatic sketch showing the tapes tied so as to hold the medial margins of the flaps in apposition. Iodoform gauze packs are used in the lateral incisions for twenty-four hours. One tape is removed on the third or fourth day, the remaining tape on the fifth or sixth day. On the seventh day the mucous membrane is removed from the margins of the clefts and sutures applied.

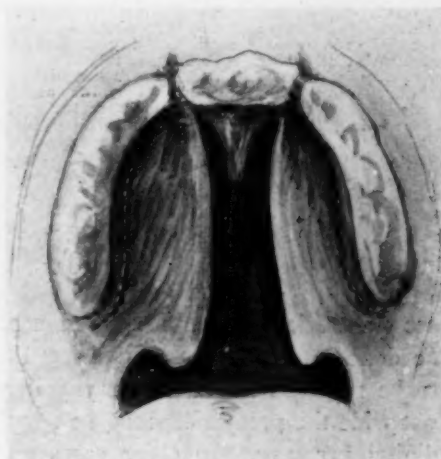


FIG. 28.—Semidiagrammatic sketch of bilateral cleft-palate, six or eight months after premaxilla has been placed in position and harelip repaired. Illustration shows the location of incisions which are carried down through periosteum, after which a thin narrow chisel is used to cut through the horizontal processes of the maxillae and palate bones. Incision is then carried entirely through the mucous membrane forming the floor of the nostril, and the entire horizontal portion of the palate brought medialward.

Incomplete harelips must be made into complete ones by carrying the incisions into the floor of the nostril in order to get correct approximation of muscle tissue in the lip and to bring the ala of the nostril into proper relation to the septum. (Figs. 2 and 3.)

In unilateral harelip and cleft-palate the alveolar process should be brought together and the lip and nostril repaired preferably between the

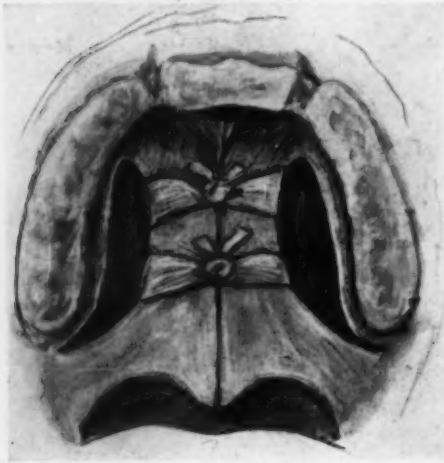


FIG. 29.—Semidiagrammatic sketch showing the method of loosening the flaps and bringing over bone in the repair of the double cleft-palate. The flaps are surrounded with two pieces of tape which are carefully tied so as to avoid cutting off any circulation. Iodoform gauze packing is used in the lateral spaces for twenty-four hours, both for the purpose of controlling any oozing and also to help hold the flaps in the desired position. One tape is removed on the third or fourth day, the remaining tape on the fifth or sixth day. On the seventh day the mucous membrane is removed from the margins of the clefts and sutures applied.

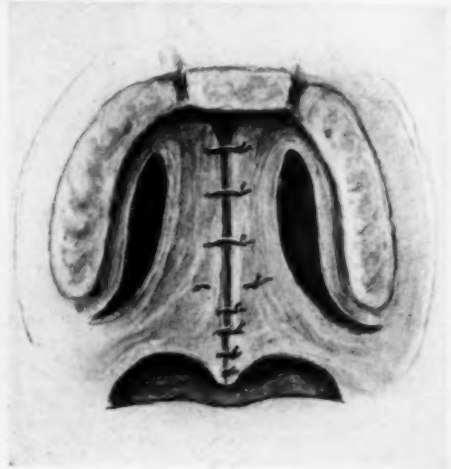


FIG. 30.—Semidiagrammatic sketch showing the application of sutures in a double cleft-palate in a two-stage operation. Double-ought wire sutures are used anteriorly, the sutures being carried through the entire thickness of the lateral flaps including the bone. These wire sutures are placed through the flaps before the mucous membrane is removed from the medial margins. This is important in that one is much less liable to detach the small strip of bone from its mucoperiosteal covering. One on-end mattress suture is used near the junction of the hard and soft palate. Posterior sutures are black silk. Tapes are again placed around the flaps as shown in figure 29, using care in seeing that they do not produce much pressure on the flaps. One tape is removed usually on the second or third day, the remaining tape on the fifth or sixth day. Remove only one or two sutures each day beginning about the ninth day and having all sutures removed on the fifteenth day after operation.

second week and the fourth month. This part of the repair can usually be done at one operation, leaving the cleft posterior to the alveolar process to be repaired later. In very young infants in which the alveolar cleft is not wide the premaxilla may be simply forced into nearly normal position by digital pressure. In older cases and in wider clefts with rotation of the premaxilla, closure of the alveolar cleft is facilitated by partially dividing the outer portion of the alveolar process lateral to the canine area with a thin chisel, allowing a greenstick fracture of the inner portion of the process when the premaxilla is forced into position. A wire suture through the alveolar process holds the margins in apposition. (Fig. 4.) The lip is then repaired as in simple harelip. (Figs. 5 to 9.)

In bilateral harelip the philtrum should be preserved, bringing its inferior edge down to form the centre of the lip margin. (Figs. 12, 14, 18, 20, 24.)

HARELIP AND CLEFT-PALATE



FIG. 31.—Case VIII. Age twenty-eight years. Unilateral harelip, bilateral cleft-palate. Lip had been operated upon when patient was two years old and again when sixteen years old. Note that vermilion border was not properly removed from margins of cleft in lip, persisting as a disfiguring red line extending to floor of nostril.



FIG. 32.—Case VIII. Showing deviation of the nasal septum, flattening of ala nasi and contour of nostril. Wide bilateral cleft of palate.



FIG. 33.—Case VIII. Showing condition seven weeks after operation on palate, four weeks after operation on lip.



FIG. 34.—Case VIII. Showing contour of lip and nostril five months after second operation.

HARELIP AND CLEFT-PALATE

Even when the philtrum is quite small its development after this method of repair is most surprising and gives a much better appearing and functioning lip than those repaired by trimming the philtrum to a V shape and approximating the lateral lip margins beneath it. We used the latter method for several years and recommended its use in several of our earlier papers, but the contracted appearance of the resulting lips in many of the cases caused us to discontinue its use.

In bilateral harelip and cleft-palate the vomer is elongated and the premaxilla shows varying degrees of superior rotation with corresponding shortening of the columella. When the deformity is marked the premaxilla can be placed in approximately normal position either by resecting a V-shaped section from the under surface of the vomer to allow postero-inferior rotation of the premaxilla (Figs. 18 and 19), or in less marked deformities the vomer can be split antero-posteriorly on the inferior surface of the anterior portion, allowing a bilateral bulging of the sides when the premaxilla is forced downward and backward into position where it is held by a wire suture.

After reconstruction of the alveolar cleft—unilateral or bilateral—and repair of the harelip, a period of several months is allowed to elapse before operating upon the remaining cleft. Such remaining clefts, and also palates with clefts not extending through the alveolar process, are preferably corrected between the ninth and the twentieth month. During the past eighteen months we have done all palate cases in which the clefts extended as far anteriorly as the midportion of the hard palate in two stages—the operations being done from five to eight days apart. In the majority of these cases we have brought the rudimentary horizontal processes of the maxillæ and palate bones over with the soft tissues, using the bone from the side not attached to the nasal septum in unilateral cases, and from both sides in bilateral cases. Operations bringing bone over with the flaps were devised originally by Ferguson, used in Philadelphia for many years by J. Ewing Mears and later revived, improved and more successfully used by W. J. Roe.

Bringing the bone over with the flaps is probably a more difficult operative procedure than to use the muco-periosteal flaps only. The ultimate results, however, we believe are distinctly better in those cases having bone in the flaps, the palates being better formed, maintain greater length, and have better function. One fact which has kept the operation from being popular has been the too frequent detachment of the bone from the mucoperiosteal flaps at the time of operation or else loosened to such an extent that it was subsequently lost. In such an event, if there is also failure of union of the mucoperiosteal portions, the necessary secondary operation is unquestionably more difficult and has less chance of being completely successful, than had mucoperiosteal flaps alone been used in the primary operation. However with our present technic of cutting and approximating the

flaps and routinely doing the operation in two stages, about one week apart, the bone is very seldom lost. The interval between operations allows time for the establishment of collateral circulation in the flaps which insures more certain and better union. (Figs. 25 to 30.) We prefer to have all the stages of harelip and cleft-palate operations completed before the child is two years old, since the cosmetic results and the quality of the speaking voice are best when the operations are done during that period. Gratifying results, however, are often obtained in older children or even in adults (Figs. 31 to 34), but the older cases are very apt to require longer training for the correction of the speech defect.

PSEUDO-CARCINOMA OF THE STOMACH*

SOME UNUSUAL LESIONS OF THE STOMACH RESEMBLING CARCINOMA

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EXPLORATORY operations on patients who seem clinically to have inoperable carcinoma of the stomach appeal very little to the average surgeon. The relatively high mortality of exploration in such patients, associated with the feeling of futility of such a procedure, may incline us to be ultraconservative in advising exploratory operation. In the great majority of instances our conservatism is justified. There is, however, a small group of middle-aged patients having unusual lesions of the stomach which resemble carcinoma clinically which upon exploratory laparotomy are found to have lesions other than carcinoma. In some instances these unexpected lesions are amenable to surgical relief. This group of patients may have palpable tumors of the stomach, or large X-ray filling defects of the stomach, or both, accompanied by symptoms which might well be those of carcinoma.

The importance of recognition of such a group is obvious, as is the necessity of embracing it in our indications for exploratory laparotomy.

The clinical histories of four patients presenting unexpected pathology of the stomach will be presented.

CASE I.—Mrs. H., aged fifty-nine, admitted October 1, 1925, to the service of Dr. George Dick. For a year the patient had had pain in the stomach which had been more or less constant. It did not seem related to food taking. The pain was worse at night. She vomited frequently, a thin, watery, brown fluid, which afforded her some relief. She had been very constipated and had noticed black stools. About seven months before she had become bed-ridden, due to weakness and extreme loss of weight. She had edema of the ankles and was dyspnoic. Her weight was about 75 pounds. The patient stated that about eighteen months before she had visited in central Illinois and while there had eaten a number of persimmons. She thought her trouble had dated from that time. This latter history was elicited after her operation.

On examination the patient was found to be extremely emaciated and dehydrated. There were no striking abnormalities found in the general examination, except in the abdomen. She was rigid in the epigastrium, especially on the left side, and the resistant abdominal wall felt suspiciously like a tumor mass in the region of the stomach, though a mass could not be outlined. Numerous examinations of vomitus showed no free acid, but from 24 to 36 combined acid. An Ewald test-meal showed free hydrochloric 11, combined acid 22. There was no blood, sarcinæ, or Oppler-Boas bacilli in the stomach contents. The urine was negative. The blood Wassermann reaction was negative. A blood examination showed hemoglobin 62 per cent.; red blood-cells 2,650,000; white blood-cells 10,500. Stool examination showed no blood. A fluoroscopic examination of the stomach revealed a large, penetrating lesion, about 3 cm. in diameter, on the lesser curvature. The stomach showed a large residue at the end of five hours. Films showed a penetrating ulcer on the lesser curvature. (Fig. 1.) The X-ray diagnosis was penetrating ulcer, most probably malignant.

* Read before the Western Surgical Association, December 9, 1927.



FIG. 2.—Hodgkin's infiltration of pyloric region of stomach.



FIG. 1.—Case I. Persimmon seed ball, with penetrating ulcer of lesser curvature of stomach

PSEUDO-CARCINOMA OF THE STOMACH

Operation was performed under local anæsthesia on October 4, 1925. The stomach lay rather high under the ribs and on palpation seemed to be the seat of a large tumor involving nearly the whole stomach. With some difficulty the stomach was delivered into the incision, when it was found that the large mass was a foreign body in the stomach. Due to firm adhesions uniting the stomach and the under surface of the liver manipulation was difficult. An incision four inches long was made into the stomach, dividing the anterior surface transversely. A foreign body, black, rather smooth on the surface, and measuring about 4 by 5 by 3 inches was removed. This foreign body was about the size and shape of half a building brick. After this mass had been cut open it was found to consist of semi-solid debris interspersed with several persimmon stones, and some material which looked like persimmon skins. The outer covering of the foreign body was about 2 mm. thick, was very hard, and when struck with a hard instrument sounded like striking on wood.

On the lesser curvature was a large penetrating ulcer, the base of which was found adherent to the under surface of the liver.

The incision in the stomach was closed. After removal of the foreign body it was impossible to pull the stomach down sufficiently to do a posterior gastro-enterostomy, so an anterior gastro-enterostomy, with a side-to-side anastomosis between the loops of jejunum was made.

Post-operatively, the patient continued to vomit occasionally and refused to eat. Owing to her extreme emaciation a jejunostomy was done three weeks after the first operation. A catheter was buried in the jejunum, and the jejunum was attached to the anterior abdominal wall. The patient improved after this procedure, but five days after the jejunostomy had been performed the catheter was inadvertently pulled out. The interne, who was called, tried to reinsert it into the jejunum, but instead of putting it into the bowel it was inserted into the free peritoneal cavity, with a resulting fatal peritonitis.

A post-mortem revealed a suppurative peritonitis, a healed incision in the stomach, and a large penetrating, non-malignant ulcer of the lesser curvature.

Comment.—While most of the text-books do not refer to phytobezoar, or persimmon food ball, Hart¹ has reported six cases from central Illinois where persimmon seed food balls were found in the stomach at operation. These masses varied in size from two to three inches to one which filled the entire stomach. In two of his patients ulcer of the stomach was an accompanying lesion. These food balls resemble the hair balls found in the stomach, and the shellac concretion found in patients who have drunk shellac

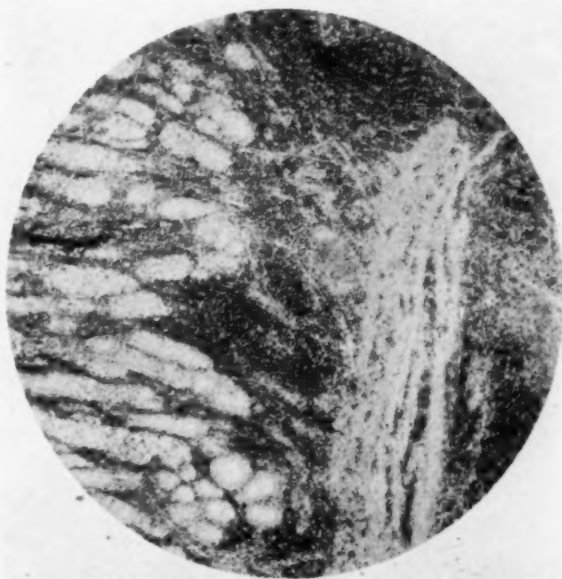


FIG. 3.—Case II. Mrs. G.—Photomicrograph of Hodgkin's infiltration of stomach.

as a beverage. The food balls formed about persimmon seeds are thought to be originated by a gum which is found in the persimmon, which agglutinates food about it. In addition to the six cases Hart reported, he was able to find but five others reported in the literature.

CASE II.—Mrs. G., aged fifty. For three months before entering the hospital the patient had had vague abdominal distress and increased gas formation. She thought



FIG. 4.—Case III. Mrs. B.—Sarcoma of greater curvature of stomach.

she could feel a lump in the stomach. There had been no vomiting and only slight loss in weight.

Upon examination a small, hard mass was felt in the right epigastrium. Clinical blood was repeatedly found in the stool. An Ewald meal showed total acid 55, free hydrochloric acid 39, and a small amount of chemical blood. A blood examination showed hæmoglobin 84 per cent., red blood-cells 4,580,000; white blood-cells 8300. An X-ray examination of the stomach showed a constant defect in the antrum reaching up to the pyloric ring. There was no obstruction to free passage of the barium to the pylorus. Films showed a filling defect of the pyloric antrum. (Fig. 2.)

A diagnosis of carcinoma of the stomach was made and an exploratory operation was performed by Dr. Dean Lewis. A large tumor mass on the greater curvature, with enlarged glands in the neck, mediastinum and peritoneal cavity, which have receded under good recovery.

PSEUDO-CARCINOMA OF THE STOMACH



FIG. 5.—Case III. Mrs. B.—Gross specimen of sarcoma of stomach.

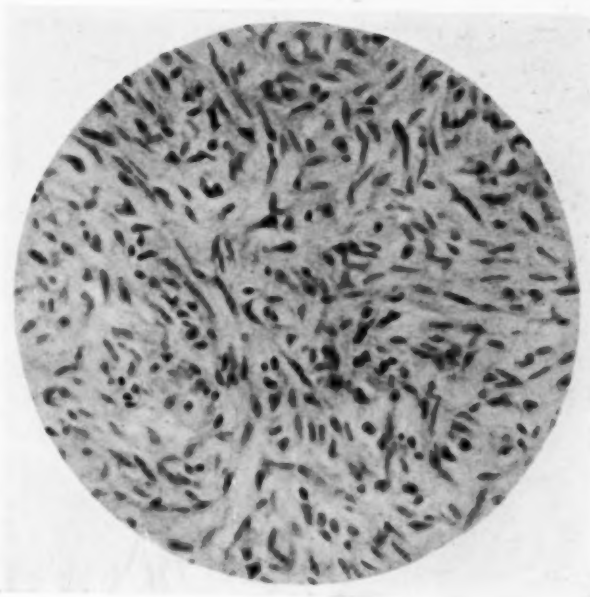


FIG. 6.—Case III. Mrs. B.—Photomicrograph of spindle-celled sarcoma of the stomach.

VERNON C. DAVID

Microscopic examination of the specimen showed a diffuse infiltration of the mucosa and muscularis with round cells and new connective tissue. (Fig. 3.) A diagnosis of Hodgkin's disease was made.

The subsequent history of the patient has been interesting because she has developed enlarged glands in the neck, mediastinum and peritoneal cavity, which have receded under X-ray therapy. A few months ago she began having blood in the stools. I examined her at this time and a lesion somewhat narrowing the rectum was found in the ampulla. This was an ulcer, with indurated base but with no crater, which bled slightly on touch.

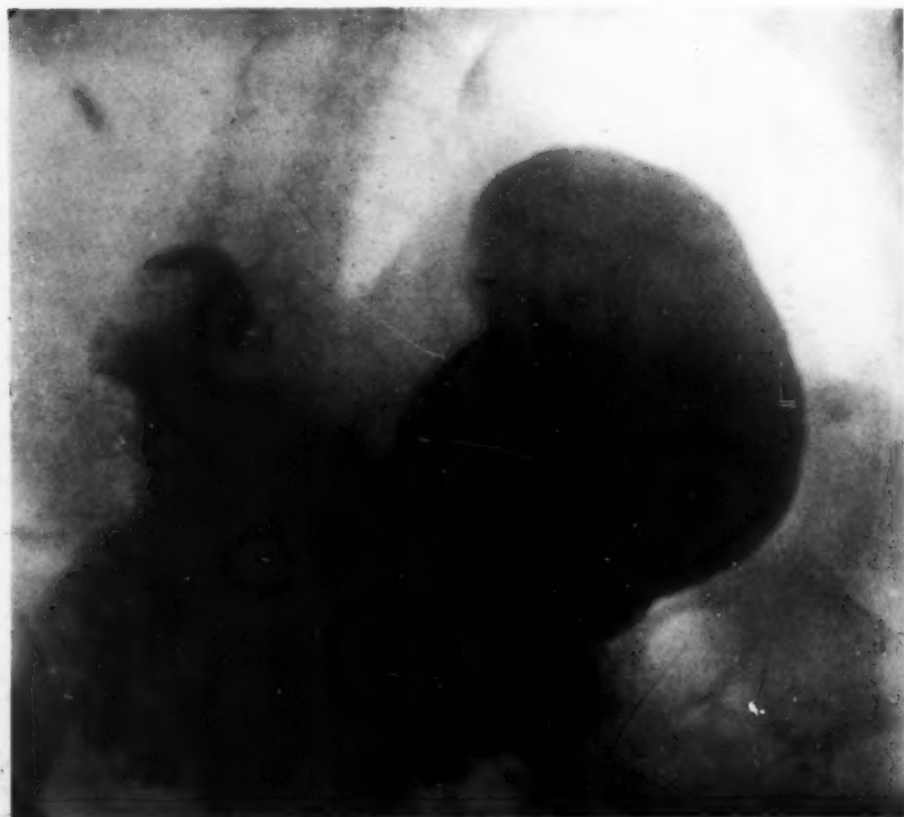


FIG. 7.—Case IV. Miss H.—Inflammatory fibromatosis of stomach.

The patient refused a biopsy of the tissue, but this lesion was probably also a Hodgkin's infiltration.

This seemingly primary involvement of the stomach by Hodgkin's disease is not common, but there are numerous examples in the literature as well as instances of primary involvement of the stomach by lymphosarcoma and leukemia.

CASE III.—Mrs. B., a patient of Doctor Bevan's. As a detailed description of this case is to be given elsewhere by Doctor Bevan, only a brief statement of the main features will be given. The patient was forty-eight years of age and for the past three and a half months had had nausea, without vomiting. She had had several gastric hemorrhages, the last one so severe that she fainted. She had felt a tumor in the epigastrium during the past month.

PSEUDO-CARCINOMA OF THE STOMACH

Examination of the patient was negative, except for the finding of a tumor about the size of two fists directly under the umbilicus. The blood examination showed hæmoglobin 42 per cent.; red blood-cells 4,030,000; fluoroscopy of the stomach showed that the barium entered along the lesser curvature but leaving a large filling defect of the greater curvature. (Fig. 4.) The abdominal mass was felt projecting into this defect in the stomach. There was no obstruction of the pylorus. The X-ray diagnosis was tumor of the stomach, probably carcinoma.

Operation by Doctor Bevan.—A pedunculated tumor projecting from the greater curvature of the stomach was found, which connected with a tumor on the inside of the stomach, which almost filled the stomach cavity. Part of the tumor was intra-gastric, lying under the mucosa, and part subserous, lying free in the abdominal cavity. No glands were palpably enlarged. A transverse incision was made in the anterior wall of the stomach and the tumor was stripped away without opening the mucosa of the stomach.

Pathology.—The tumor looked grossly like a large lipoma (Fig. 5), but on microscopic examination was found to be a spindle-celled sarcoma. (Fig. 6.)

Comment.—Primary sarcoma of the stomach is a rarity but in the reported cases it has taken its origin in the sub-mucosa, muscularis, or subserosa, forming a large, broadly attached tumor, or one which is pedunculated, lying mostly outside of the stomach. These sarcomata have little tendency to ulcerate and their course has been relatively benign. Farr² has reported a case of penetrating ulcer of the stomach which upon histological section was found to be sarcoma.

There is a rather large group of myomata of the stomach reported which have varied in structure, and which potentially may become sarcomatous. This group included liomyoma, adenomyoma, and fibromyoma.

CASE IV.—Miss H., aged sixty-four, was referred by Dr. George Dick. The patient complained of weakness, indigestion, regurgitation of food after eating, burning sensation in the upper abdomen, dizziness, excessive gas formation, and a loss of ten pounds in weight during the past year. The above symptoms have developed during the



FIG. 8.—Case IV. Cross specimen of inflammatory fibromatosis of the stomach without ulceration of mucosa.

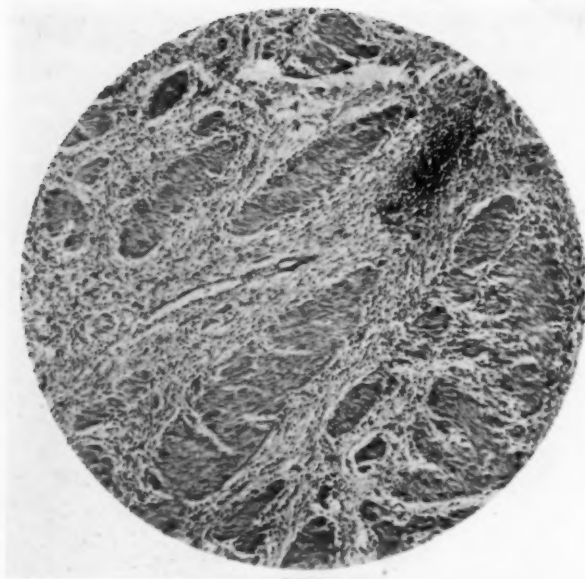


FIG. 10.—Case IV. Inflammatory fibromatosis of stomach. Photomicrograph of section through muscularis.

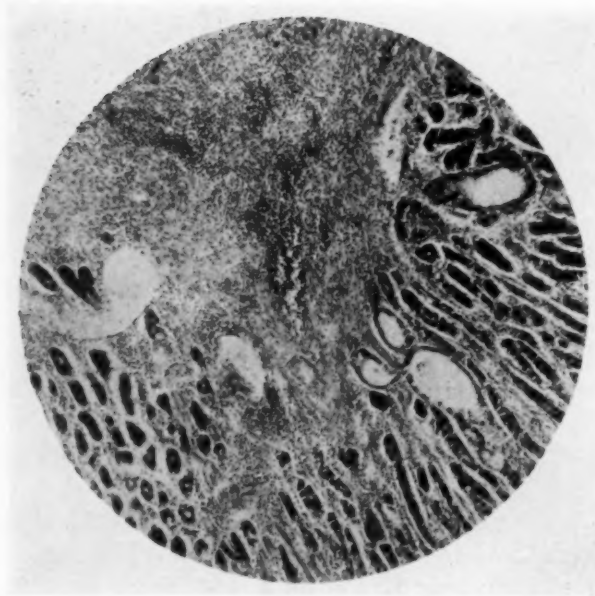


FIG. 9.—Case IV. Inflammatory fibromatosis of stomach. Photomicrograph of section through mucosa and submucosa show round-cell infiltration.

PSEUDO-CARCINOMA OF THE STOMACH

past fourteen months. In the past history the patient stated that she had had a Pott's disease of the upper lumbar spine when she was four years of age and this resulted in a marked kyphosis in the lumbar region. She had a hysterectomy for fibroids fifteen years ago.

The general physical examination revealed no marked abnormalities apart from the deformity. Her pulse rate was 100. A blood examination showed hæmoglobin 78 per cent.; red blood-cells 4,000,000; white blood cells 8000. Her blood-pressure was 156 and her blood Wassermann reaction was negative. The urine was negative. An Ewald meal showed hydrochloric 32, total acid 53. Microscopic and chemical blood was present. A motor meal showed that the stomach emptied in practically normal time. A stool examination revealed chemical blood. A fluoroscopic examination of the stomach showed that the antrum was markedly narrowed, for a distance of four inches from the pylorus. This deformity remained constant. The stomach emptied rapidly. There was a good duodenal cap. The films showed canalization of the antrum. (Fig. 7.) The diagnosis was almost surely carcinoma.

An exploratory laparotomy was done in February, 1927. The pyloric antrum, including most of the lesser curvature and about one-half of the greater curvature, was the seat of a hard tumor mass which roughly maintained the outline of the stomach, but which had converted the wall of the stomach into a contracted, hard, tubular mass. This indurated area stopped abruptly at the pylorus. The

stomach was freely movable and there were no enlarged regional glands. The serosa of the stomach was bright and glistening, but appeared to be traversed by subserous, fibrous strands which were indistinctly seen beneath the serosa.

A Billroth II resection of the stomach was carried out, removing somewhat over one-half of the stomach.

The gross specimen (Fig. 8) when cut open showed that in the affected portion of the stomach there was no gross ulceration of the mucosa. The mucosa was thrown up in coarse, heavy longitudinal rugæ. The mucosa and submucosa was about 7 mm. thick through the tumor and about 4 mm. thick in the healthy stomach wall. On cut section the submucosa was seen to be much thickened and was gray and fibrous in appearance.

Histology.—Beginning directly under the mucosa was an extensive round-cell and connective-tissue infiltration (Fig. 9), which was most marked in the submucosa but which separated the muscle bundles of the muscularis and to a lesser degree was present in the subserosa. (Fig. 10.) The borderline between serosa and muscularis was not distinct, due to the widespread formation of connective tissue. The submucosa made up about one-half of the thickness of the stomach wall and consisted of round-cell infiltration and connective tissue. In these round-cell accumulations there were numerous

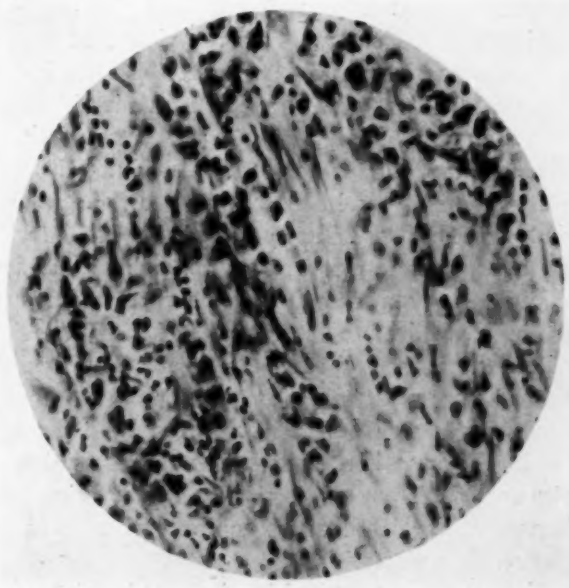


FIG. 11.—Case IV. Inflammatory fibromatosis of stomach. Photomicrograph of section showing the character of the cells.

large mononuclear eosinophile cells. The muscularis mucosa was not everywhere distinct, though there was no evidence of breaking through it by the epithelium. The mucosa was everywhere intact and was not ulcerated. There was no microscopic evidence of carcinoma.

No area in the sections looked at all like tuberculosis or syphilis.

After-history.—The patient has gained in weight and is practically free from symptoms. Occasionally she has regurgitated small amounts of food. She is unable to eat as much at a time as she was able to prior to the onset of her illness.

Comment.—Obviously this lesion falls in the category of linitis plastica, or leather bottle stomach. As has been so frequently pointed out in the literature, either chronic inflammation, as syphilis or tuberculosis, idiopathic fibromatosis, or fibrocarcinoma may give the picture of linitis plastica. The majority of observers favor the view that most of the cases are carcinoma of an unusually fibrous type. Kirby Dwight³ has recently said that linitis plastica stands as sort of a "no man's land" between the obviously malignant and the plainly benign cases of hypertrophic induration of the stomach wall. Ewing⁴ is of the opinion that most if not all of these diffuse cirrheses of the stomach are atypical fibrocarcinomata. He states that it has long been known and has been specifically noted by Rokitansky and Kaufmann that the epithelial cells in schirrous carcinoma of the stomach may be reduced to a minimum, or may largely disappear, so that a very careful microscopic examination is required to detect traces of carcinoma. Lyle⁵ made a careful review of the literature and concluded that of 126 cases he collected 68 were benign and 58 were malignant. It must be remembered that some cases reported as benign have on subsequent examination been found to be malignant.

In the case here reported syphilis could be excluded by reason of an absence of history of this disease, a negative Wassermann reaction, and the important fact that microscopically there was no evidence of gumma formation or endarteritis.

While the patient had been afflicted with a severe tuberculous bone disease in childhood, there was no evidence of tuberculosis of the stomach either grossly or microscopically.

As to the diagnosis of fibrocarcinoma, it can only be said that examination of repeated sections failed to show carcinoma cells, and that there was no evidence of ulceration of the mucosa. In addition, there was no enlargement of the regional glands and no known metastases.

This deformity of a circumscribed, indurated lesion of the stomach showed a fibromatosis of all layers except the mucosa, with areas of round-cell infiltration, and until evidence to the contrary is available the lesion must be regarded as a benign inflammatory fibromatosis.

In conclusion, it may be emphasized that:

1. Foreign bodies in the stomach, as hair balls, food balls or shellac balls;
2. Chronic granulomata, as Hodgkin's, leukæmia or lymphosarcoma;
3. Chronic inflammatory lesions, as syphilis, which may be ulcerative or cirrhotic, and primary tuberculosis, which may be ulcerative or fibrous (Severin)⁶;

PSEUDO-CARCINOMA OF THE STOMACH

4. Tumors other than carcinoma, as sarcoma, and the benign tumors, as myoma, adenoma, papilloma, hæmangioma and,

5. Inflammatory fibromatosis, which may ultimately be classified as typical fibrocarcinoma, may all be easily confused with the usual carcinoma of the stomach, and should be carefully excluded before exploratory operation is denied a patient apparently suffering with inoperable carcinoma of the stomach.

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TREATMENT OF ULCER OF THE STOMACH AND DUODENUM

A PLAN BASED ON THE CLASSIFICATION OF PATHOLOGIC TYPES

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THE first step in the intelligent treatment of gastric and duodenal ulcers is a classification of their pathologic types, for the various conditions coming under the common heading of peptic ulcer are so diverse that no one form of therapy could be hoped to suffice for them all. The simple ulcer of the gastric mucosa, for example, will usually yield to medical measures which would be futile in the case of the chronic indurated ulcer. To be most efficient, the treatment of gastric or duodenal ulcer must therefore be varied according to the pathologic condition found in the individual case.

No classification of peptic ulcer will ever be wholly satisfactory until we understand more fully the etiology of this lesion. At the present time, our knowledge of this subject is largely fragmentary and conflicting. Of recent years much stress has been laid upon focal infection, particularly with streptococci having an elective affinity for the stomach and duodenum, such as those described by Rosenow. Nicotine, too, must have a toxic action on the stomach by virtue of its cumulative action; for many of us have experienced heartburn, the symptom of acidity, following even the moderate use of tobacco.

A most important factor leading to peptic ulcer, if only an indirect one, is the daily abuse of the stomach. Next to the genitals, the stomach is probably the most abused organ in the body. Human intelligence has not yet reached the high stage at which judgment predominates over the cravings of the physical appetites. As we inquire carefully into the histories and habits of a large group of patients with gastric and duodenal ulcer, we cannot escape the conclusion that the daily abuse of the stomach is a most important contributory cause.

The only absolute fact we have with regard to the causation of peptic ulcer is that the lesion coexists with a very acid gastric juice. To be sure, an occasional case is encountered in which acidity is normal or subnormal; but, even in these exceptional instances, it is probable that hyperacidity was present at some time or other. As the acid gastric juice is the principal obstacle to the healing of ulcers, much of our medical and surgical treatment is based on the alleviation of this symptom and the protection of the ulcer from its ill effects.

Classification of Peptic Ulcers.—Because of our inadequate knowledge of the etiology of gastric and duodenal ulcer, a hard and fast classification is impossible. However, the following simple grouping will be found convenient, principally as a guide to the selection of proper treatment:

TREATMENT OF ULCER OF THE STOMACH AND DUODENUM

1. Ulcer of the mucosa. 2. Ulcer of the submucosa. 3. Ulcer of the entire wall. 4. Indurated ulcer. 5. Delaminating ulcer, *a*, with stenosis; *b*, without stenosis.

Ulcers extending no deeper than the mucosa do not require surgical attention. One may confidently expect them to yield to a proper medical régime within a comparatively short period of time. If the symptoms and positive röntgenologic findings persist after several weeks of careful medical treatment, the condition is probably not a mucosal but a submucosal ulcer.

As one reads the literature on gastric and duodenal ulcer, he comes across many references to the failure of medical treatment. But such statements mean nothing, unless the writer specifies how medical treatment was administered; whether the patient was confined to bed or allowed to attend to his business; whether the diet was correctly prescribed, and in sufficient detail; and whether, if correct diet was ordered, the patient followed his instructions religiously. Obviously the term "medical treatment" for peptic ulcer may cover a multitude

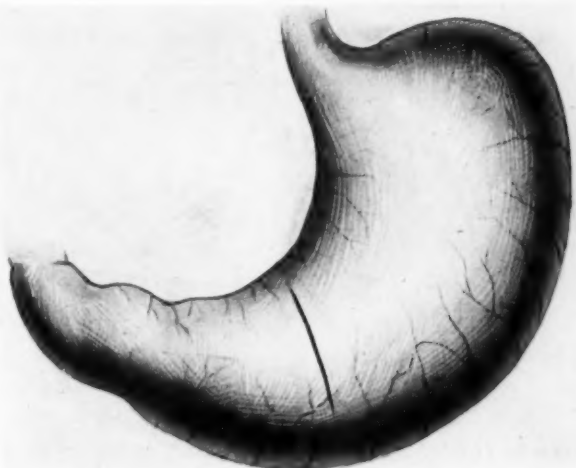


FIG. 1.—Incision in stomach.

of therapeutic measures, and it is necessary to be specific in each instance. Even the classical Sippy diet has been so varied by individual gastro-enterologists that the term no longer has a uniform significance. And we have no right to call the treatment in a given case a "medical failure," until we have been assured of its thoroughness.

On the other hand, we must not accept "medical cures" as such merely because the symptoms have been alleviated or even removed completely. We must inquire into the degree of improvement shown on röntgenologic study and also keep the patient under observation for some time in order to be sure that the relief is permanent. The terms "medical failure" and "medical cure" have led to much confusion and should not be used without careful discrimination.

Submucosal ulcers are much more refractory to medical treatment than those involving only the mucous membrane. Although they sometimes heal under medical measures, it has been my experience that surgical intervention is frequently required. However, medical treatment for several weeks with the patient in the hospital must always be given a fair chance before surgery is justifiable.

New Treatment for Submucosal Ulcers.—Of recent years I have been obtaining excellent results with a new procedure for submucosal ulcer, designed specially to meet the conditions found in this type of lesion. The operation consists essentially in gastro-enterostomy plus cauterization of the ulcer from within the stomach.

The ulcerated area is reached and treated as follows: Following the posterior gastro-enterostomy, the abdominal cavity around the stomach is packed with warm gauze pads. When this step is completed, the assistant picks up a fold of the anterior wall of the stomach. This fold is incised in a direction at right angles to the long axis of the organ. As soon as the stomach is opened, a suction tube is inserted and the organ emptied. Under thorough illumination with a light in the stomach, the mucous membrane is carefully explored and the ulcer located. The edges of the stomach are then held apart with Ellis forceps and the ulcer thoroughly cauterized with the actual cautery. This stage of the operation is completed by closing the stomach with catgut in the usual manner.

With this procedure my operative results have been excellent. And it has led me to observe that multiple ulcers are much more common than is sometimes supposed. By means of a thorough inspection of the mucous membrane of the stomach under direct illumination, I have frequently found several ulcers in cases in which the existence of more than a single ulcer was not suspected.

From my experience I believe that gastrojejunal ulcers following gastro-enterostomy occur much less frequently when the entire ulcer base is cauterized in the manner that I have advocated and all the ulcers are found. The sterilization of the ulcer bases by cauterization is probably the important factor in bringing about this immunity. It is quite probable that many gastrojejunal ulcers following gastro-enterostomy are due to secondary infection arising from infected ulcers overlooked either in whole or in part at the time of operation. When the ulcer is cauterized from outside the stomach, as in the Balfour operation, the operator may fail to destroy the entire ulcer, inasmuch as the base is frequently very large; furthermore, he may easily overlook a non-palpable ulcer.

It is possible that the etiology of gastrojejunal ulcer is the same as that of the kissing ulcer described by Moynihan; that is, an ulcer on the anterior wall of the stomach exactly opposite the original ulcer on the posterior wall. In other words, direct contact and consequent infection may be the important factor in the causation of gastrojejunal ulcer. In that event, sterilization of all ulcers in the stomach after gastro-enterostomy should be considered an essential part of surgical treatment.

A further advantage of the procedure I have recommended over the Balfour operation is the fact that it eliminates all suturing over infected area.

Gastric Resection for Indurated Ulcer.—For the types of ulcer with induration, and also those that cause constriction or delamination, I believe

TREATMENT OF ULCER OF THE STOMACH AND DUODENUM

that resection of the stomach is preferable to gastro-enterostomy. Most ulcers involving the entire wall of the stomach or duodenum are necessarily indurated and therefore belong to this category.

My principal justification for this apparently drastic treatment lies in the fact that many workers, particularly those at the Mayo Clinic, have demonstrated early malignant changes, microscopically visible, in the edges of many calloused ulcers of this type; in the high frequency with which we encounter inoperable carcinoma of the stomach; and in the not uncommon occurrence of malignant disease following so-called conservative operations for peptic ulcer. According to Eusterman and Bueermann,¹ every gastric

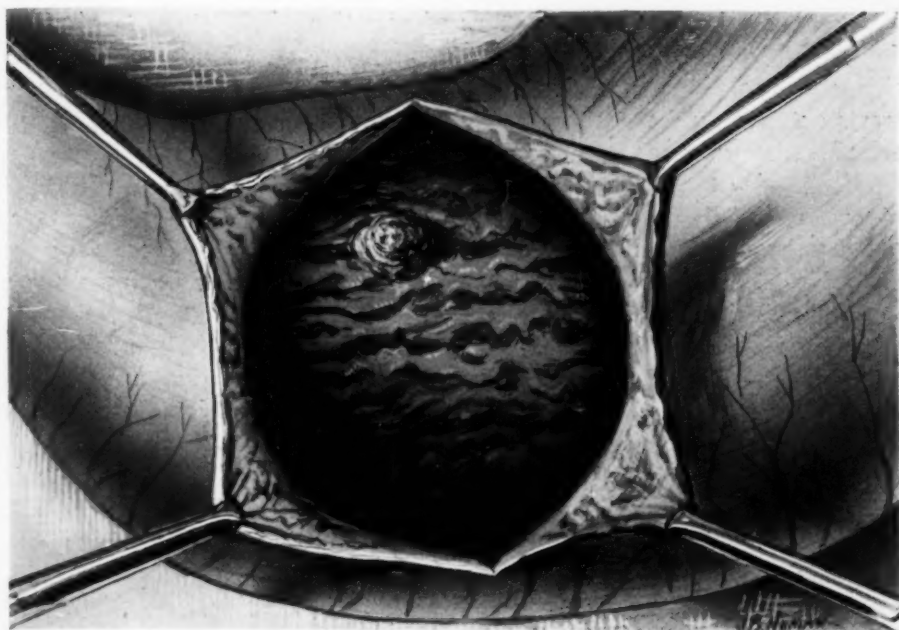


FIG. 2.—Exposure of ulcer.

ulcer may, for practical purposes, be regarded as a potential carcinoma and a number of gastric lesions having many of the gross clinical and röntgenographic characteristics of benign ulcer are actually carcinomatous. Other unfortunate sequelæ of the time-honored gastro-enterostomy are gastro-jejunal ulcer and gastrojejuno-colic fistula, although I believe these complications to be avoidable.

On the other hand, it must be admitted that with present-day technic the mortality for gastric resection is higher than for gastro-enterostomy. Even in the hands of the best surgeons in various centres of the world, I feel that the present mortality from this operation is almost prohibitive, not to mention the unnecessary deaths that will follow when the operation is performed by inexperienced men who feel that they also can do whatever they have seen others do. But it must be remembered that the subject of gastric resection

is still in its infancy and that future technical improvements will probably do much to improve the safety of this operation.

It was not so long ago that cholecystectomy was recommended to take the place of cholecystostomy for chronic infections of the gall-bladder. Originally this suggestion met with strong opposition, and the principal objection of its opponents was the higher mortality. Yet to-day the technic of cholecystectomy has been so greatly improved that the mortality is just as low as that of cholecystostomy and the morbidity is much lower.

When thyroidectomy was first performed some years ago, the mortality was staggering; to-day we can count it as below that of most other major operations.

It is to be hoped that the history of resection of the stomach will soon follow the path of cholecystectomy and thyroidectomy. With proper selection of cases not allowed to advance too far, conscientious preliminary treatment, improved and more careful operative technic and thorough after-treatment, we may soon find gastric resection within realm of safe surgery.

Concerning Operative Technic.—In all operations for gastric or duodenal ulcer, I regard the preliminary treatment as of great importance. My practice is to keep the patient in the hospital for three or four days preceding the operation. During that period, a diet of high caloric value but requiring a minimum of digestive activity is allowed. The feedings are small in amount but given at frequent intervals. On three successive days before the operation and immediately before he is taken to the anæsthetizing room, the patient receives a gastric lavage with warm saline solution. Just before the operation he is given a large amount of fluid by mouth and also by hypodermoclysis under the breast. On the second night before operation, a cathartic is administered.

A large number of operations for gastric and duodenal ulcer have been reported in the literature. In order to formulate our own technic, which should vary according to conditions found in the individual case, it is well to have a knowledge of many of them.

Judd² believes that, in the treatment of duodenal ulcer, combined excision and partial duodenectomy have definite advantages over gastro-enterostomy. The anterior half of the pyloric sphincter, together with the cap of the duodenum and the ulcer, is excised. When this portion of the duodenum has been removed and the anterior part of the sphincter excised, two openings, one at the lower end of the stomach and the other at the upper end of the duodenum, stand out. They resemble the openings of a gastro-enterostomy after the posterior row of sutures has been placed. While this operation is not technically difficult, Judd does not recommend it in cases in which the ulcer is located a considerable distance down the duodenum or in which the duodenum is too firmly fixed to be readily mobilized.

In operating for duodenal ulcer, Pannett³ prefers partial duodenectomy to gastro-enterostomy. He is impressed with the fact that the results of gastrojejunostomy are far from satisfactory and that a better technic is

TREATMENT OF ULCER OF THE STOMACH AND DUODENUM

needed for handling these cases. In the present state of our knowledge, however, partial duodenectomy cannot be used for the treatment of all cases of duodenal ulcer.

In the surgical treatment of ulcer of the stomach, Carter⁴ resects the lesser sac of the stomach including the pylorus, performs a gastrojejunostomy by suturing the entire width of the stomach into the longitudinal opening and the distal half of the jejunal loop and closes the anterior wall of the lesser sac by attaching the gastrohepatic omentum to the lesser curvature of the stomach and the convex surface of the jejunum and the gastrocolic omentum to the proximal and distal loops of the jejunum and greater curve

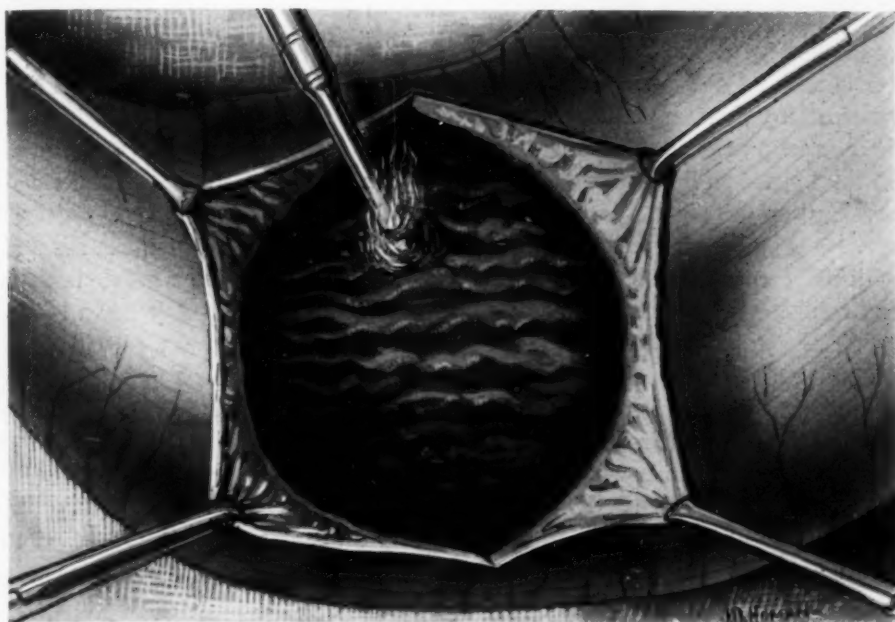


FIG. 3.—Cauterization of ulcer.

of the stomach. By this means he fixes the jejunum in position and maintains the normal anatomic position of the stomach.

When the ulcer is confined to a small area of the pylorus, I prefer complete closure of the distal end of the stomach with posterior gastrojejunostomy. If the ulcer is so extensive as to require removal of a large portion of stomach, suturing of jejunum to the resected portion of stomach is to be preferred. However, occasional deviations from this rule are necessary.

The mortality from resection of the stomach has been lowered not so much by a diversity of operative methods as by more careful technic, particularly in the closure of the duodenum. In my⁵ observation, careless closing of the duodenum has resulted in a number of unnecessary deaths and I consider this neglect an important factor in the mortality from operations for peptic ulcer. My practice is to invaginate the duodenum with a purse-

string suture rather than to suture it with over-and-over stitches. If the duodenum cannot be freed sufficiently to use a purse-string suture, I prefer to limit the operation to a gastro-enterostomy. Lahey is credited with the statement—and I agree with him—that it is better to leave a duodenal ulcer untreated and close the intestine adjacent to the stomach rather than to risk an incomplete closure of the duodenum.

As in the operations for the radical cure of hernia, it is not the new operation so much as the better technic for those that we have that is needed in the case of resection of the stomach.

From 1916 to 1920 I performed seventy-nine gastro-enterostomies and no gastric resections for ulcer of the stomach or duodenum; from 1920 to 1923, twenty-four gastro-enterostomies, fifty gastro-enterostomies plus cauterization of the ulcer from the outside, eight resections of the stomach for ulcer, and five for cancer. From 1923 to date, I have performed gastro-enterostomy plus cauterization of the ulcer from within the stomach in thirty-four cases; resection of the stomach for indurated ulcer, in twenty-nine. These figures indicate the change that has taken place in the treatment of peptic ulcer during the past ten years, and I feel that the statistical averages of a great many other clinics will correspond with my own. My belief is that with more careful technic along the lines that I have indicated, the ultimate end results will become much better and the immediate mortality much lower.

Selection of Cases.—In the Clinic we have devised a set of rules for general guidance with regard to the treatment for different types of gastric or duodenal ulcer. Of course, these rules are subject to deviation according to conditions found in individual cases.

In general, the following policy is followed at the Clinic:

- (1) In persons under thirty years of age with gastric or duodenal ulcer, surgery should be advised only after careful medical treatment has failed to give permanent relief.
- (2) In persons past thirty with indurated ulcer, surgery is indicated immediately the diagnosis is made, because of the constant danger that malignancy may develop from the base of the ulcer.
- (3) In uncomplicated ulcers, particularly in persons under the age of forty, gastro-enterostomy plus internal cauterization of the ulcer is the method of choice.
- (4) In persons with indurated ulcers, particularly those past forty years of age, resection of the stomach should be performed. Exceptions to this rule may be taken when the condition of the patient does not warrant so extensive an operation.

CONCLUSIONS

1. While focal infection undoubtedly occupies a definite rôle in the etiology of gastric and duodenal ulcer, we must not overlook the important part played by the daily abuse of the stomach.
2. Peptic ulcers may be classified as follows: (a) ulcer of the mucosa,

TREATMENT OF ULCER OF THE STOMACH AND DUODENUM

(b) ulcer of the submucosa, (c) ulcer of the entire wall, (d) indurated ulcer, and (e) delaminating ulcer with or without induration.

3. A new operation for the treatment of submucosal ulcers is described. It consists essentially in gastro-enterostomy plus cauterization of the ulcer from within the stomach.

4. It is possible that gastrojejunal ulcers following posterior gastro-enterostomy are due to contact infection from the original ulcer, as in the case of the kissing ulcers described by Moynihan.

5. The ultimate operation for indurated ulcers, particularly in older patients, will probably be partial gastrectomy.

6. Careless closure of the duodenum is an important factor in the mortality.

7. In patients under thirty, medical treatment should be given a thorough trial before operation is advised.

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INTUSSUSCEPTION OF THE SMALL INTESTINE INTO STOMACH THROUGH A GASTRO-ENTEROSTOMY STOMA

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RETROGRADE intussusception of the small intestine following gastro-enterostomy has, in contrast to the total number of gastro-enterostomies done, a very small per cent. of occurrence. In the practice of many active gastro-intestinal surgeons, it has never occurred, at least to be diagnosed by them or by the patient himself, as anything more than an ordinary acute gastritis. However, in 1924, Drummond reported a case, and was able to obtain reports of thirteen others in the literature. Further reference to the literature has enabled us to add nine additional case-reports to those given by Drummond, which, with the one we ourselves present in this paper, gives a total of twenty-four.

As suggested by Kopp,⁶ the importance of the proper recognition of this complication is evidenced by the fact that six of seventeen cases then recorded ended fatally, and it is for that reason that we are presenting our case, and summarizing the knowledge which examination of the cases on record is able to give us.

CASE REPORT.—A woman, aged forty-one, housewife by occupation, was seen by us July 29, 1925, at 8 P.M., her chief complaint being persistent vomiting of three days' duration. Seven years before she had been operated upon for chronic appendicitis and a right ovarian cyst. Six months later, a gastro-enterostomy for a duodenal ulcer had been done. For two years prior to the gastro-enterostomy the patient had been suffering with nausea and vomiting of blood-tinged material, and epigastric pain coming on twenty to thirty minutes after meals. There had been considerable loss of weight during this time.

The symptoms complained of before the gastro-enterostomy was done were relieved, but had been replaced by a chain of symptoms related to the stomach and occurring with each menstrual period. These were characterized by epigastric discomfort, dull in type and diffuse over the upper abdomen; and general malaise, headache, anorexia and nausea coming on twenty to thirty minutes after eating, and accompanied by vomiting. The vomitus consisted of dark brown material, coffee-ground in type, and very foul smelling. Between these monthly attacks she felt quite well, was up and about, and was on a general diet. During the past two years her weight has decreased from 158 pounds to 102 pounds.

Present Illness.—On July 27, at 7 P.M., two days before being seen by us, the patient suddenly became nauseated and began to vomit. During the two previous days she had eaten heartily of crab meat and other seafood. The vomiting persisted, and at first was undigested food material, but later became dark brown and very foul smelling. The pain was paroxysmal in type, occurring about every ten minutes, and was confined to the upper abdomen. The bowels moved several times, the stools being thin and dark brown, with a foul odor.

INTUSSUSCEPTION OF SMALL INTESTINE INTO STOMACH

Physical Examination.—Middle-aged white woman, lying in bed, and vomiting every five minutes. The vomitus is dark brown and coffee-ground in type. She cries out with abdominal pain every three or four minutes, despite a large dose of morphine given three hours before.

The facies are pinched, the forehead and extremities cold and clammy. The radial pulse is almost imperceptible, but when obtained is ranging around 120 per minute and regular. The temperature is 97. The systolic blood-pressure is 78 millimetres of mercury, the diastolic 60 millimetres. Despite the severe degree of shock, the mucous membranes and the finger tips are of good color. The mucous membranes of the mouth are very much patched and dehydrated.

The head, neck and chest are negative.

Abdomen.—The scars of the two former operations are seen; one in the upper midline and one in the lower midline. Both are well healed and there is no hernia in either. Just to the left of the umbilicus and slightly above it, there is a rounded prominence of the abdominal wall. There is no discoloration of the skin over this area. No peristaltic waves are seen at the time of examination, but they had been seen four hours previously by Doctor Burch, the patient's family physician.

Neither kidney, spleen or liver are palpable. No tenderness is noted over these areas. At the site of the prominence above mentioned, may be palpated a mass 15 cm. on a side, extending laterally, to the left of the midline, with its centre just above the level of the umbilicus. It is exquisitely tender and gives one the impression of being soft and mushy in consistency. There is marked muscle spasm over this region. The remainder of the abdomen is soft, and no tenderness and no masses are made out.

Normal peristalsis is heard over the lower abdomen, and is excessive over the epigastrium. Vaginal and rectal examinations not done.

At this time, a tentative diagnosis was made of high obstruction of the jejunum, the causative factor of the obstruction being a perforated gastrojejunal ulcer.

The patient was sent to the hospital in an ambulance, and during the next twelve hours was given 1000 c.c. of normal salt solution intravenously, two hypodermoclyses of 1000 c.c. each, and a transfusion of 500 c.c. of whole blood, together with external heat, morphia, adrenalin and caffeine sodium benzoate. She responded to this treatment, her mucous membranes lost their parched appearance, the face became fuller and brighter, the systolic blood-pressure came up to 128 mm., the temperature 99, and the pulse 96. In other words, the patient's condition improved so much that an operation could be undertaken, which, at the time of the first examination, was entirely out of the question, due to the extreme degree of shock. The vomiting and pain persisted, and the abdominal mass increased somewhat in size during these twelve hours.

Before the operation and transfusion, the red blood-cells were 4,500,000, white blood-cells 13,000; the urine showed one plus albumin and a few granular casts. The vomitus was positive for blood.

Operation.—July 29, 1925. Anæsthetic—ethylene, with novocaine infiltration of skin and fascia. The abdomen was opened through the upper left rectus region. This was directly over the mass. Several rather dense adhesions along the former upper incision were found and separated. The mass palpated before the operation was found to be within the stomach, and, upon lifting up the transverse colon and mesocolon, to expose the site of the former gastro-enterostomy, a hernia of the jejunum through the gastro-enterostomy stoma was found, and the mass within the stomach was found to be the œdematous jejunum.

Gentle traction, together with pressure from above, over the stomach, easily released the herniated jejunum, which was found to be a loop about 30 cm. in length, beginning 15 cm. distal to the site of the gastro-enterostomy. There was considerable œdema of this loop, with obvious vascular stasis, but no gangrene. The stoma of the gastro-enterostomy was 8 cm. in its long diameter. This was free of any induration or ulcer.

The duodenum and stomach were examined and found to be negative. The pylorus was patulous and no scarring or signs of the former ulcer were made out.

The other abdominal organs were negative.

After the herniated jejunum was freed, it was sutured to the transverse mesocolon, with the idea of preventing any recurrence. The question of cutting off the gastro-enterostomy at this time was considered, but was thought inadvisable on account of the patient's condition. The abdomen was closed in the usual way. The patient stood the operation very well, and left the operating room in excellent condition.

Post-operative Course.—The patient continued to vomit immediately after the operation, but the vomiting was relieved by a gastric lavage, done the night of the operation. Liquid food in small amounts at a time was started forty-eight hours after the operation, and was retained without discomfort. The bowels were moved with enemata, and the patient ran an uneventful post-operative course, leaving the hospital on the fourteenth day following the operation.

At the present time, which is two years after the operation, the patient's condition is excellent. She has had no return of the abdominal attacks, the digestion is good and her weight now is fifteen pounds more than it was at the time of the operation.

A personal talk with the surgeon who did the gastro-enterostomy brought out the fact that the stoma was made very much smaller than was found at this time, and the suggestion was made that the same condition of herniation of the jejunum into the stomach had occurred with each vomiting attack during the past several years. At these times, the jejunum had always released itself, until the present attack, but this repeated herniation had no doubt increased the size of the stoma.

Etiology.—That the presence of the gastro-enterostomy is of etiological significance in these cases goes without saying. The type of gastro-enterostomy is apparently of no effect on the occurrence of the intussusception. Drummond offers a possible explanation in that the presence of the stoma may make possible an occasional over-rapid emptying of the stomach, with at some time resultant irritation of the jejunal mucous membrane sufficient to cause anti-peristalsis. If this results in retrograde intussusception, efforts of the stomach to empty itself will only serve to further aggravate the condition. Kopp⁴ is of the opinion that such attacks are of greater frequency than the literature would give one to believe, but that spontaneous reduction of the intussusception prevents a proper realization of the true nature of the condition. In our case, it is not hard to imagine that the attacks complained of prior to the final operation were in reality retrograde intussusception relieved by spontaneous reduction.

Occurrence.—Lewisohn's case occurred on the sixth post-operative day, but the usual onset is much later, from nine months to fifteen and one-half years. Drummond¹ gives seven years as the average.

Symptoms and Diagnosis.—With a history of previous gastro-enterostomy, retrograde intussusception should always be thought of in the event of sudden attacks of cramping pain in the upper abdomen attended by vomiting of food material and bile, and later of blood. Bloody vomitus is a symptom of every case in which the intussusception has carried the jejunum into the gastric cavity. The general condition of the patient goes rapidly down-hill, so that, as in our case, he is often in shock when first seen. Rigidity and distention of the abdomen, which we report, is not a constant

INTUSSUSCEPTION OF SMALL INTESTINE INTO STOMACH

finding. A tumor in the upper abdomen is visible in approximately 50 per cent. of the cases. Leucocytosis and a rise of temperature are not present; blood-pressure is normal unless shock intervenes.

Recurrence.—Recurrence is reported in only one case, that of Baumann,¹¹ in which it took place eight weeks after the initial reduction and was relieved by resection of 10 centimetres of intussuscepted gut.

Treatment.—Treatment, in every case in which the patient's condition permits, is immediate operation. Measures, in addition to reduction of the intussusception, are at the jurisdiction of the individual surgeon, since no uniform treatment has been devised. If the duodenal ulcer is healed, the anastomosis of the gastro-enterostomy should be divided as this is the only certain way to prevent recurrence of the same condition.

CONCLUSIONS

1. Retrograde intussusception following gastro-enterostomy has been reported in twenty-four instances.
2. The symptom complex is one of sudden acute upper abdominal pain, with vomiting, first of food, later of bile and blood. Visible peristalsis, rigidity and tenderness are possible but not constant factors. Shock is a frequent complication.
3. The time of occurrence after operation is usually a matter of years.
4. Treatment is immediate operation.

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GASTRO-JEJUNO-COLIC FISTULA

AN UNUSUAL AND FATAL COMPLICATION FOLLOWING OPERATIONS
FOR DUODENAL ULCER

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THE following case is reported because of the unusual complication of gastro-jejuno-colic fistula following a partial gastrectomy and pylorotomy for presumably a recurrent gastro-jejunal ulcer. Lahey,¹ in discussing gastro-jejunal ulcers, mentions their tendency to perforate into the transverse colon and Martin² describes such a specimen seen in one of the London museums. However, the formation of a large cloaca, communicating with the stomach, jejunum and transverse colon, is sufficiently rare to warrant the report of such a case. The patient was on the surgical service of Dr. Frank S. Mathews, to whom I am indebted for permission to use the clinical history.

CASE REPORT.—The patient was a white male, aged forty-six, who came to the hospital complaining of pain in the left upper quadrant of the abdomen of four days' duration. The majority of the following history was obtained from a letter brought by the patient from the surgeon who had operated on him two months previously. The patient was first operated upon in 1924 for a duodenal ulcer. The operation was gastro-enterostomy, cholecystostomy, and appendectomy. A year later he was operated upon for a marginal ulcer. At this time the gastro-enterostomy was undone and a jejunostomy was performed. This stoma never healed completely and continued to drain about a teaspoonful of amber-colored material each day. The gastric pain gradually returned and two months ago on September 24, 1927, he was operated on a second time for recurrent ulcer. At this operation a partial gastrectomy and pylorotomy were done with a gastrojejunostomy of the Polya type and an entero-anastomosis. Convalescence was uneventful and he returned home on October 14, 1927. He had been taking a dram of milk of magnesia daily, and had been free from pain. During the week before admission there had been no drainage from the jejunostomy.

Four days before admission the patient began to have discomfort in the left upper quadrant of the abdomen, close to the old jejunostomy. The pain came on gradually, increased in severity, and was of a colicky nature. It came day or night and was severe enough to cause his family physician to give him codeine. There was no nausea or vomiting. Black stools had been present for several days. In addition, there had been gnawing pains in the right upper quadrant of the abdomen, radiating to the back. The patient had perspired a great deal, but knew of no fever. He had had daily enemata with fecal return but had passed little gas.

Physical examination of the head, heart, and lungs showed no abnormality. The abdomen showed two well-healed scars in the upper right quadrant, one appearing older than the other. In the lower medial portion of the upper left quadrant there was a small sinus opening surrounded by an area of red skin. There was little distention and no fluid was detected. There was a marked tenderness throughout the entire upper portion of the abdomen. No masses could be felt.

¹ Lahey, F. H.: J. A. M. A., vol. lxxxix, p. 1659, 1927.

² Martin, E. K.: Brit. Jour. Surg., Supp. 14, 1927.

GASTRO-JEJUNO-COLIC FISTULA

A plain X-ray film of the abdomen, done November 7, 1927, showed only gas-filled distended intestines. The following report is made by Dr. Percy Brown from a gastro-intestinal barium X-ray series begun on November 15, 1927.

"The fluoroscopic findings in this case are extraordinary. Evacuation takes place from the stomach by what seems to be three passages: (1) pylorus, (2) stoma into the ileum, (3) stoma into the jejunum.

"The passage by the pylorus is much more rapid than is usually seen in situations wherein artificial stomata have been produced. Through the passage evidently passing into the jejunum, it sometimes appears as if the content were progressing in the inverse direction. A satisfactory explanation of this phenomenon cannot be arrived at. The general evacuation of the stomach is rapid, although there is a moderate degree of residue obtaining, possibly in the immediate vicinity of the artificial openings. In a

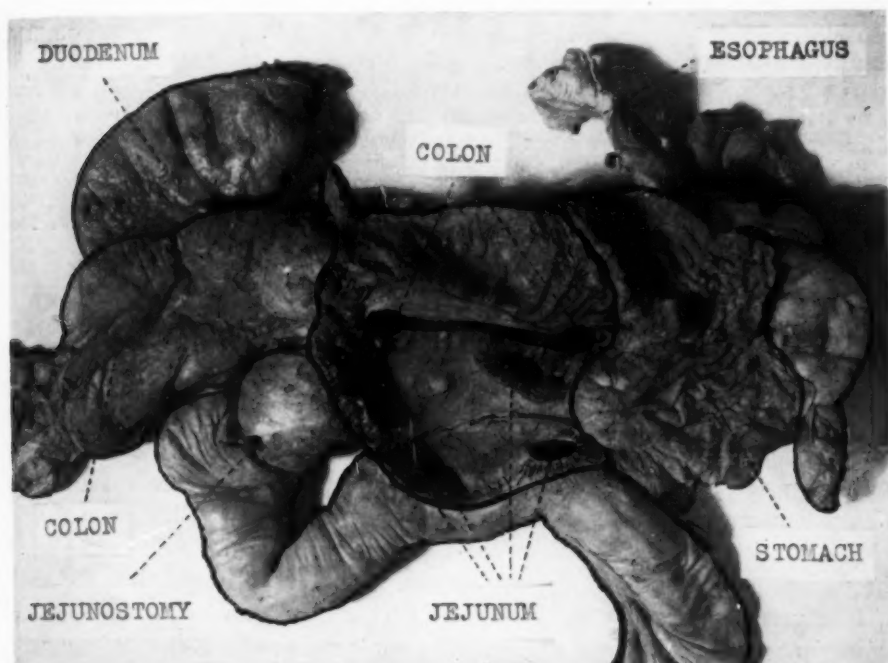


FIG. 1.—Photograph of the stomach and a portion of the jejunum and transverse colon showing an ulcerative communication between these organs.

very few moments after the injection of the meal, the entire parajejunal field becomes obscured with multiple coils of filled ileum, and from then on it becomes almost impossible to follow the process of physiology, on account of the shadow complexity."

Examination of the blood showed the following: Haemoglobin 65 per cent.; red blood-cells 3,500,000; white blood-cells 13,200; polymorphonuclear leucocytes 82 per cent.; lymphocytes 18 per cent. The blood Wassermann was negative. The stools were thin, watery, and ochre colored. The guaiac reaction was ++. There was no mucus. The temperature during the entire stay in the hospital ranged between 98.6° F. and 100° until the time of death, when it rose to 102° F. The pulse ranged from 90 to 100.

During the stay in the hospital the patient complained of pain which was severe enough to require codeine. He was quite hysterical and at times sterile hypodermics of water seemed to relieve the pain. Two days before death the temperature dropped to 97° F. This was accomplished by extreme diarrhoea. The patient collapsed the night before death and was revived only slightly by caffeine and hypodermoclyses of 5 per cent. glucose solution. He remained in shock for about twenty-four hours and died

twenty-three days after admission. Abstract from the *Autopsy Protocol*: In the upper abdomen there are two old surgical scars, one 18 cm. long, the other 15 cm. long, both situated slightly to the right of the midline. There is a third healed surgical incision to the left of the midline, 4 cm. long. This is slightly above the level of the umbilicus.

On opening the abdomen the peritoneum is smooth, white, and glistening. The stomach, transverse colon, and first portion of the jejunum are adherent to the anterior abdominal wall by old fibrous bands. The intestines are collapsed and contain only a small amount of fecal material. The distal half of the stomach, pylorus and appendix are missing. At the point of resection of the stomach there is a spherical cavity bounded behind by the anterior surface of the third part of the duodenum, and having the front wall made up of the peritoneum of the anterior abdominal wall to which it is bound by fresh fibrinous adhesions. This deficiency in the anterior wall is about 4 cm. in diameter. The whole cavity is about 8 cm. in diameter. Opening into it from above is the stomach. An ulcerative process has involved the transverse colon which is connected with the cloaca by two stomata. Below these are two openings, one for the proximal portion of the jejunum, and a separate one for the distal end. At the most dependent portion the ulceration has involved an adherent loop of the jejunum in two places so as to form openings into the general cloaca. Just proximal to these openings is the point of the old jejunostomy which is identified by a fibrous band which fixes it to the anterior abdominal wall. There is no evidence of peritonitis.

Microscopic examination of the borders of the ulcer show only chronic inflammatory tissue, and no evidence of carcinoma.

Summary.—The patient was a man aged forty-six, who was first operated upon three years ago for duodenal ulcer. The operation was gastro-enterostomy, cholecystostomy, and appendectomy. One year later the gastro-enterostomy was undone and a jejunostomy was performed for a recurrent marginal ulcer. Two years later, or two months prior to the last admission, for reasons unknown, a partial gastrectomy and pylorotomy were done with a gastro-jejunostomy of the Polya type and an entero-anastomosis. The patient made an uneventful recovery and was discharged improved.

An attack of acute pain in the left upper quadrant of the abdomen brought the patient to St. Luke's Hospital for the first time. A tentative diagnosis of a recurrent marginal ulcer was made. There were no immediate surgical indications, and the patient was in too poor condition for elective surgery. While still being observed and studied in the hospital, the patient went into sudden shock and died about twenty-four hours later. The clinical diagnosis was internal hemorrhage, but this could not be demonstrated at autopsy. The immediate cause of collapse and death was not found. None of the lesions of the abdomen could be implicated.

Autopsy revealed an ulcerative communication between the stomach, transverse colon, and jejunum. None of these stomata appeared fresh and from the pathological condition found it is not reasonable to believe that sudden perforation into one of these loops of intestine caused the collapse before death. The communication between the stomach and transverse colon was not suspected, either from clinical findings or from Röntgen examination. The exact mechanism by which enemata could be given without nausea, regurgitation, or other special symptoms referable to the stomach is hard to explain. History of this patient, as analyzed in retrospect, demonstrates unusual and early fatal post-operative complication of surgery for duodenal ulcer.

SURGICAL INTERVENTION IN EXTRA-UTERINE PREGNANCY *

OBSERVATIONS IN THE TREATMENT OF 109 CASES AT THE
PENNSYLVANIA HOSPITAL

BY HENRY P. BROWN, JR., M.D.
OF PHILADELPHIA, PA.

EXTRA-UTERINE pregnancy is a condition frequently encountered among patients admitted to a general hospital. In the present paper it is sought to record the experiences in dealing with this condition at the Pennsylvania Hospital where all of the gynæcological patients are treated as general surgical cases. The diagnoses were made and operations performed by the various chiefs and assistants connected with the surgical departments, thus possibly representing more truly the average results to be obtained in handling this group of patients than when they are assigned to a service limited to gynæcology.

For the privilege of reporting this series, I am indebted to Doctors Gibbon, Mitchell and the former chiefs to whose services the cases were admitted.

During the period from 1918 to September, 1927, there were 109 cases of ectopic pregnancy admitted to the Pennsylvania Hospital, and while we fully realize that this is a very small number in comparison with some of the recorded series, it seemed worth while to compare our results with those of others.

The recent literature contains numerous articles dealing with the etiology and pathology of ectopic pregnancy, and it is not our intention to dwell at any length on these topics in this paper. Those interested in this aspect of the subject are referred to an article by M. R. Robinson¹ for an excellent description and discussion of its etiology and pathology. He states that the condition is due more to a functional disturbance of the tube, rather than to an inflammatory and mechanical condition of the tube itself, and presents gross and microscopic evidence to bear out this statement.

As has been shown by numerous authors, the cause of rupture and hemorrhage, the conditions from a general surgical viewpoint which are chiefly responsible for the symptoms, are dependent not only on the distention of the tube by the growing embryo, but also on the degree of penetration of its walls and blood-vessels by the fetal elements.

In our series we found that the combination of vaginal bleeding and abdominal pain was the condition most frequently causing the patient to seek relief (fifty-five per cent.) while lower abdominal pain without bleeding,

* Read before the Philadelphia Academy of Surgery, December 5, 1927.

occasionally accompanied by nausea or vomiting, was present in thirty-six per cent. of the cases. In three instances the patients merely complained of vaginal bleeding, no history of pain being elicited.

The question of whether bleeding from the uterus indicates a living or dead embryo is rather an academic one and we leave it to those better qualified than the writer to pass judgment, sufficient to say that among eminent authorities it is still a matter of controversy.

Only once did a patient complain of pain in the chest and abdomen—the so-called shoulder pain, supposedly due to sub-diaphragmatic irritation by the free blood in the abdominal cavity.

Eleven patients (ten per cent.) presented the typical picture of an acute ruptured ectopic pregnancy—menstrual history—sudden severe abdominal pain—fainting—anemia—low blood-pressure—vaginal bleeding, etc. Graf-fagnino,² in recording one hundred and eighty-six cases, states that fourteen and one-half per cent. gave a history of shock.

We do not place too much reliance on the patient's menstrual history, for where this was ascertained, thirty-eight per cent. stated that they had not missed a period; fifty-one per cent. missed one or more periods; in six cases it was irregular, and four women developed an ectopic while nursing their last children.

The interval between the last pregnancy and ectopic conception varied widely, thus, one woman, the mother of two children, stated that while two months' pregnant she miscarried one month previous to her admission to the hospital, her present symptoms having been of two weeks' duration. Another, the mother of three, was certain that she had miscarried forty days previous, her present symptoms also being of two weeks' duration. Eight cases had been pregnant less than one year previous to their admission and the vast majority had of course been pregnant one or more years previous to their present condition. Twenty-five per cent. of the patients had never been pregnant before; five of them had only had miscarriages; twenty-one per cent. had one child, most of the women being para, with or without abortions. One woman, an Italian, had to her credit five living children, ten who died in infancy and five or six miscarriages.

In four instances the patients were undergoing the second operation for ectopic, and only one other in the series had been previously operated upon—a salpingectomy in a colored woman.

At operation, or from the history, salpingitis was noted as having been present in ten per cent. of the cases, absent in eighty-three per cent., and no notation made in the remainder. This is somewhat in accord with the statement by Dr. Emily Barringer in discussing the paper by Robinson, that in thirteen hundred cases of gonorrhoea she did not see one case of ectopic while in the same series there occurred seventy-one cases of intra-uterine pregnancy.

The factor of a high leucocyte count, as pointed out by various writers, was not observed frequently enough to be of diagnostic value, for in only eleven cases where such an observation was made, was it over fifteen thou-

SURGICAL INTERVENTION IN EXTRA-UTERINE PREGNANCY

sand. This may possibly be due to the fact that many of the cases in our series did not present themselves till the ectopic pregnancy had existed for some time.

In not a single instance was the recorded temperature on admission above 101° F.

As the onset of symptoms of an extra-uterine pregnancy is often insidious, depending largely on the degree and rapidity of rupture of the tube or embryonic sac, so, the interval between the onset of symptoms and the patient's admission to the hospital varied widely, thus seventeen per cent. were admitted within twenty-four hours of the onset—twenty-two per cent. between one and two weeks and twenty-four per cent. one or more months after noticing symptoms.

There seems to be quite a difference of opinion as to the most favorable time to operate upon a case of actively bleeding ectopic, some authorities (Polak⁶) advising delay until the patient has reacted from shock and hemorrhage, on the theory that when the patient has improved, she is in better condition to withstand surgical measures. Others advise exploration as soon as possible, giving blood transfusion or saline infusion (we prefer glucose and insulin, rather than saline) as indicated. We feel that the risk of delay in the hope that the bleeding will stop, is greater than when the abdomen is opened and the bleeding checked under direct supervision, thus, in sixty instances (fifty-five per cent.) operation was done within twenty-four hours of the patient's admission. In patients showing evidence of active bleeding, we do not give transfusion or infusion and delay operation in the hope that the patient will react, as Polak states is done by some general surgeons.

In cases where a differential diagnosis was not made upon the patient's arrival, the period between admission and operation obviously varies, upon ten occasions operation being done upon the second day, varying in frequency up to a week, a surgical emergency of course not being present in this group. Twice, from one to two weeks intervened before a diagnosis was made and operation performed, and twelve times, more than two weeks elapsed before the patient's abdomen was opened.

The question of differential diagnosis between ectopic pregnancy and conditions simulating it is not within the scope of this paper, sufficient to say that where operation revealed an ectopic pregnancy, a correct pre-operative diagnosis had been made in sixty-two per cent. of the cases. This does not take into account those instances in which exploration revealed that the pre-operative diagnosis of extra-uterine was incorrect. Most of our diagnostic errors were due to the condition being thought one of salpingitis, with or without involvement of the ovary—nineteen cases. (During the period covered by this paper there were admitted to the hospital 1337 cases listed as salpingitis, with or without involvement of the ovary.) Next on the list was appendicitis, five cases—then intra-uterine abortion with four, some of which were self-induced—then fibroids, four—pelvic abscess, three, and ovarian cyst, one, in the above order of frequency. In several cases, five times—

the error was made in thinking that various combinations of the above conditions were present. One case, a colored woman of twenty-eight with a plus four Wassermann, was kept under observation in the hospital for thirty days in the belief that she had a pelvic abscess, and when vaginal puncture was done, bloody fluid was revealed. When her abdomen was opened later on, a glistening tense mass was seen in the broad ligament having the appearance of a cyst. Upon opening this, it was found to be a pregnancy in the broad ligament, about three months, and the tube was removed and a pack inserted. She had rather a stormy convalescence but ultimately recovered. Another colored woman of thirty-four, with a large uterine fibroid and a dead abdominal fetus of about three and one-half months, was observed for thirty days before exploration was done.

Other cases could be cited demonstrating the difficulty in arriving at a correct diagnosis, but the point we wish to emphasize is that where the picture is not that of a surgical emergency, we have not seen any harm result from postponing operation in an attempt to arrive at a correct diagnosis. Conversely, where the condition is one of urgency, we do not delay exploration till a correct differential diagnosis is made. In this class, five abdomens were opened in the belief that the patient was suffering from acute appendicitis, and in one instance an acute appendix accompanied a right cornual pregnancy.

It is of interest to note that one patient referred her pain to the left side, and it was found that the ectopic was in the right tube.

In the present series, the right side was involved in fifty-eight per cent., and the left in thirty-eight per cent. of the cases, the resident failing to mention this point in the remainder.

The tube alone was removed in eighty-one per cent. and the tube and ovary in fifteen per cent. of the cases. Twice it was thought advisable to remove both tubes, and in one ovarian pregnancy, only the ovary was removed.

The question of whether transfusion or infusion is necessary in a woman who has lost a great deal of blood from a ruptured ectopic, was of considerable interest to us. In a few of the earlier cases an attempt was made to remove as much as possible of the extravasated blood, but in seventy-four per cent. of the cases this was not done, an attempt being made to leave as much of his blood in the abdomen as possible, this being, we believe, the procedure in most of the clinics to-day. Thirteen times it was thought advisable to perform auto-transfusion, using sodium citrate or normal saline solution as the vehicle for the blood, and in a similar number, one or more intravenous infusions of saline were given.

In no instance is it recorded that a post-operative reaction occurred which was attributed to this procedure.

Six of the thirteen patients receiving the saline infusion died, and in no instance was a death recorded among those receiving a blood transfusion.

This statement is not to be interpreted as indicating that the fatal outcome

SURGICAL INTERVENTION IN EXTRA-UTERINE PREGNANCY

was associated with the fact that an infusion had been given, but rather that the patient's condition was so desperate that it was thought infusion advisable.

In the series of one hundred and ten operations—one patient had a second ectopic removed by us—there were seven deaths—a mortality of six and three-tenths per cent., which is rather high—twelve and three-tenths in Graffagnino's series²; four and thirty-nine hundredths for Wynne³—eight per cent. at Cooke County,⁴ and less than one per cent. at the Women's.⁵

A very obese woman of forty-one, with symptoms for a week preceding her admission, was operated upon within a few hours of her arrival. A ruptured right tube was removed—her abdomen contained a great deal of free blood and she was given one thousand c.c. of saline infusion while on the table. Two days later her blood sugar went to two hundred and seventeen mg. per 100 c.c. She was given five hundred c.c. of whole blood and a similar amount of saline, and felt greatly benefited. She showed a marked nephritis, and died suddenly the same day.

A twenty-nine-year-old white girl was unconscious and almost pulseless when brought to the hospital, her tube having apparently ruptured only a few hours previous. A ruptured right tube was removed, the abdomen was found filled with blood—she was given normal saline intravenously but failed to react, and died three hours later.

A white girl of thirty-two, whose right tube had been removed four years previously—pathology unknown—had been having symptoms for two weeks previous to admission, and was taken acutely ill the day she came to us. A ruptured left tube was removed—she was given hypodermoclysis, the notes stating that both antecubital areas were incised without success in an attempt to give a transfusion—she reacted quietly and died three days later from a recurrence of hemorrhage. Post-mortem not obtained.

The fourth case was a woman of thirty-five, who at operation within five hours of the onset of symptoms typical of a ruptured ectopic, showed a ruptured right tube, which was removed. She was given five hundred c.c. of saline intravenously and died three hours later without reacting.

Sarah S., a white woman of twenty-two, with symptoms of four days' duration before admission, had a right cornual rupture, with profuse hemorrhage. A litre of saline was placed in the abdomen before closing and five hundred c.c. was given intravenously. Two days later she was given another five hundred c.c. of saline infusion, and died on the third post-operative day. The abdomen was reopened, no fresh blood was seen and the ligature had not slipped.

In a white woman of thirty-six with a ruptured right tube, and free hemorrhage, five hundred c.c. of saline having been given intravenously at the time of operation and her post-operative reaction having been fairly good, the resident's notes merely state that she died next day.

Ella D., a colored woman of twenty-nine—the earliest case of the series—was the one case ending fatally, in which a correct diagnosis was not made. She had not missed any periods since the birth of her third child. Pain in the lower abdomen and vomiting had been present for three weeks before she sought relief in the hospital, and on admission her T.P.R. were 103-156-48 with 10,000 leucocytes. She was a thin, poorly nourished restless negress, with moist skin, pale mucosa, jaundiced conjunctivæ and a distended abdomen which was very prominent in the lower half, and the liver was palpable four fingers' breadth below the costal margin. She had great general abdominal tenderness which was well marked in the lower left quadrant, with rather generalized rigidity across the lower abdomen. It was thought that dulness was detected in both flanks. Vaginal examination revealed a slight amount of fetid discharge—the cervix was soft and admitted one finger, the lower uterine segment was soft—the uterus somewhat enlarged and not freely movable. A vague indefinite resistance was felt posterior to the uterus, in the midline, extending more to the left than to the right. A consultation

was held with the chief of the opposite service who advised exploratory operation. The opinion of the majority was that the condition was one of salpingitis, with endometritis, and operation was deferred. She was given an intra-uterine douche—we have long since discarded this procedure—and promptly went into a state of collapse. Next day her jaundice was much deeper, she had two chills—temperature 104; hæmoglobin 78 per cent.; leucocytes 8400; she grew much weaker and died two days after admission. Post-mortem showed a ruptured left extra-uterine pregnancy—free bloody pus in the pelvis—general peritonitis—hypertrophy of the liver—abscess of the spleen and septic endometritis.

As was mentioned at the outset of this paper, this series is too small to warrant drawing any conclusions of value and we fully realize that we have not presented any new thought. From a review of the cases, however, a few factors have been impressed upon us, among which are—the difficulty in arriving at a correct diagnosis in the atypical cases—the fact that not much reliance can be placed in the patient's menstrual history nor the fact that she has not had previous pregnancies—that when the symptoms are vague enough to create a doubt as to the diagnosis, *i.e.*, an acute surgical emergency not being present, there is no harm in a reasonable delay in order, if possible to arrive at a correct diagnosis—that where it seems indicated an auto-transfusion does no harm, although it must be remembered that many patients with extensive loss of blood recover quite well without this procedure—in those cases presenting symptoms of active bleeding immediate operation should be done without waiting for the patient to react from shock, and that no matter how extensive the intra-abdominal hemorrhage or degree of shock may be, there is always a chance for the patient to recover, as was noted many times.

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FRENCH-HEEL FRACTURES OF THE TARSAL SCAPHOID

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IN REPORTING the above condition the author is unaware of a similar entity being fully described in the literature and wishes to present an original contribution upon a condition that is far from uncommon.

Ross and Stewart in a study of sprain-fracture,¹ and in a further study of sprain-fracture as an essential to

the occurrence of dislocation,² have performed the best work on the experimental production of this condition in dogs. They likewise note 145 cases of various sprain-fractures as found in reviewing the X-ray films

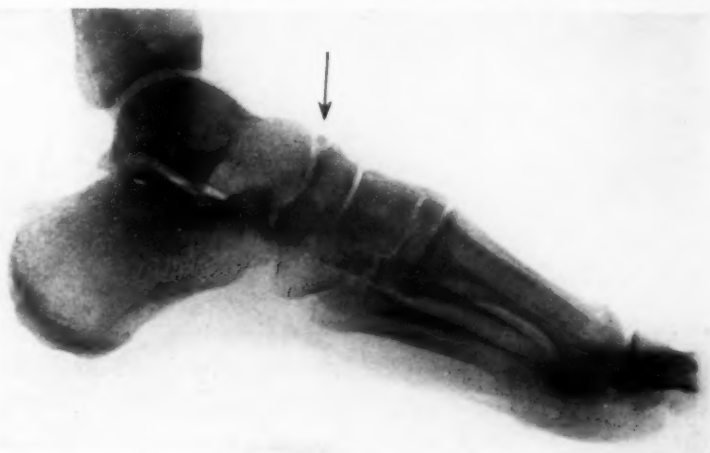


FIG. 1a.—Sprain fracture of the tarsal scaphoid, the size of a pea.

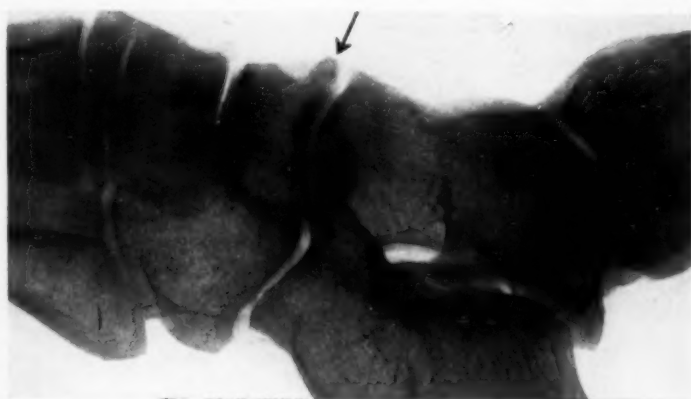


FIG. 1b.—Fragment half the size of a cherry, fractured from the tarsal scaphoid.

able in seven cases to demonstrate sprain-fractures of the astragalus, os calcis, cuboid, scaphoid, cuneiforms and metatarsals.

Three cases reported by Cook³ were comminuted fractures of the body

of the Lanke-nau Hospital. Forty-six of these occurred around the ankle-joint. Experimenting upon anæsthe-tized dogs in the production of sprain-frac-tures of differ-ent joints, they were definitely

rather than sprain-fractures of the superior surface of the scaphoid. Horowitz's cases were of the tubercle.⁴

It is generally recognized that fractures and severe sprains about the ankle-joint are besides disabling, frequently difficult to treat. Sprain-fractures and severe sprains of the ankle often give the attending physician more annoyance and the patient more pain than do complete fractures. This is partly due to the attitude of the patient who, learning that an X-ray is negative for gross fractures feels that he may (and does) use the part as he desires—the overuse and insufficient immobilization resulting in chronically relaxed ligaments or tendons ununited to their bony attachments. Mostly it is due to a failure to diagnose accurately and treat properly.



FIG. 2.—Illustrating high heeled evening slippers without anterior support to the ankle, strap pumps, and moderate sized heel, lacing oxfords.

The author has had occasion to treat a large number of traumatic ankles and because of the routine of X-raying all injuries to bones and joints, has observed a condition which is a definite clinical entity. It is probably far more common than is suspected and will be seen most often by those who, more than others, uniformly X-ray all traumatic bone and joint conditions. Manges points out that sprain-fractures are far more common than has heretofore been appreciated.⁵

Anatomically it is a sprain-fracture of the superior surface of the tarsal scaphoid affecting the anterior capsular ligament of the ankle-joint, the superior astragalo-scaphoid ligament and the dorsal scapho-cuneiform ligament.

Occasionally a small fragment of bone is detached from the anterior portion of the superior surface of the astragalus or the posterior portion of the superior aspect of the cuneiforms. The size of the bony fragment varies from that of a pea to half the size of a cherry. (Fig. 1.)

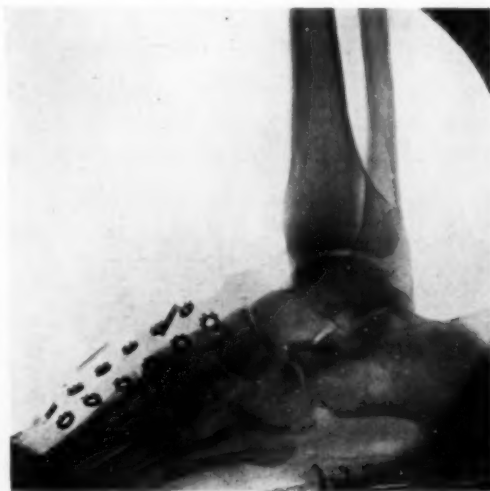


FIG. 3.—Röntgenogram of foot with low heeled shoes. Note the horizontal plane of foot, the close morticing of tarsal bones, lacing support and relaxation of anterior portion of ankle-joint.

FRENCH-HEEL FRACTURES OF THE TARSAL SCAPHOID

Etiology.—The cause, in the majority of cases, has been due to hyperextension (plantar flexion) of the foot upon the ankle-joint accompanied as a rule by some inversion or eversion. *Eighty per cent. have occurred in females wearing high-heeled open slippers or pumps, hence the name.* Thereby hangs the cause and treatment.

There are sundry varieties of footwear for the female sex ranging from so-called sensible, low-heeled, lacing Oxfords (Fig. 2) to moderate or high-heeled strap-pumps with a single strap across the tarsus which supports the tarsal joints anteriorly, to high-heeled open pumps and other extremely high and spiked-heel evening slippers without any anterior supporting straps, being completely open in front. The latter types when used occasionally cause no particularly permanent pathology. When used daily, rather than on occasion, the continually maintained hyperextension of the foot is bound



FIG. 4.—Röntgenogram of foot in high heel strap-pump. Observe the extended plane, widened tarsal joint spaces, and the lack of anterior support resulting in chronic sprain of the anterior ligaments.

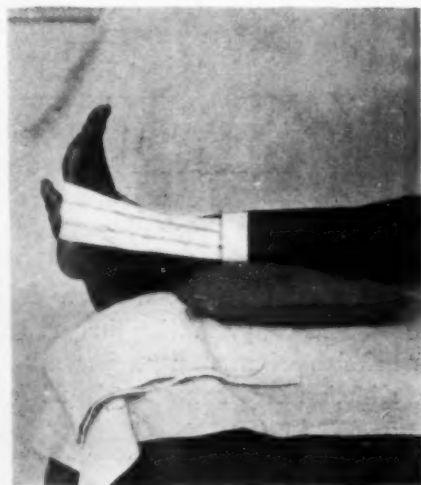


FIG. 5.—Anterior "stirrup" adhesive straps to prevent extension of foot and maintain support while fibrous union of ligaments occurs.

to result in a tense and chronically weakened condition of the anterior ligaments supporting the ankle-joint. The author has X-rayed the ankle-joint in various types of footwear and noted the widened anterior tarsal joint spaces occurring with high-heeled shoes in comparison to the normal anatomical joint positions in low-heeled shoes. (Figs. 3 and 4.)

A sudden twist of the ankle or fall upon stairs (66 per cent.) with the foot already in a hyperextended position and weakened state results in a detachment of the bony tendinous or ligamentous attachment. A sprain-fracture is the result.

Treatment.—To secure bony union of the fragment, to relax the stretched and weakened ligaments and secure a strong and healthy foot again, it is necessary at once to prevent the foot from being hyperextended or extended.

It has been the author's experience in the fifteen cases outlined to achieve this by having the patient discard high-heeled slippers for several months and wear low-heeled Oxfords with anterior adhesive straps. Extension itself, for two or three weeks, is prevented by slightly flexing the foot and securing it in this position by anterior "stirrup" adhesive straps. (Fig. 5.) These are approximately two inches wide and eighteen to twenty-four inches long, secured to the lateral surface of the lower one-fourth of the leg, passed laterally over the ankle, across and under the plantar aspect of the tarsal region and up to a point on the leg opposite the start. Several straps overlapping each other are required to maintain



FIG. 6.—Sprain-fracture of the superior surfaces of the tarsal scaphoid and cuneiform.

the foot in slight flexion. The straps may likewise be so applied as to cause eversion or inversion of the foot if and when desired.⁶ A figure-of-eight bandage to the foot and ankle may be used in addition; alone, the bandage is practically of no value. The straps should be examined and changed, or reinforced if necessary, every five days for three weeks or possibly more, depending upon the individual case. It is generally advisable to have the patient remain at home for the first few days. After this, if immobilization that permits the foot from being extended has been secured, permitting the patient to walk without pain but with some constriction of movement, her usual activities may be resumed. Charlestoneing, athletics, etc., naturally should be avoided.

After three weeks of the "stirrup" straps, an elastic ankle support can be worn to advantage in mild cases, and should be worn, of necessity, in all severe cases.

Clinical Notes.—In the last three years the author has seen 20 cases of tarsal sprain-fractures, fifteen with sufficient recorded data to be reported. Of the 15 cases, 12 (80 per cent.) occurred in females, 3 or 20 per cent. in males. The average age was 26.6 years, the youngest was 17 years of age,

FRENCH-HEEL FRACTURES OF THE TARSAL SCAPHOID

and the oldest 39 years. Seven were reported by the röntgenologist, eight (over 50 per cent.) were not. Falls on stairs or steps caused 10 (66.6 per cent.), twists 2 (13 per cent.), falls from a height 2 (13 per cent.), and direct trauma 1, or 6 per cent.

The tarsal scaphoid alone was affected in 9 (60 per cent.) of the reported cases and in all five unreported cases. The scaphoid and astragalus together were affected in one case, the scaphoid and cuneiform in two (Fig. 6), the astragalus (Fig. 7) in two, and the astragalus with a small chip from the anterior surface of the tibia in one case. It will be seen from these cases that the tarsal scaphoid, alone or with other bones, was affected in 80 per cent. of the injuries.

Ecchymosis on the lateral or anterior aspect of the ankle-joint was present



FIG. 7.—Sprain-fracture of the anterior superior surface of the astragalus.

in 75 per cent., once it extended dorsally toward the toes. Swelling was present in all, generally anterior or lateral to the ankle-joint. Pain on pressure over the tarsal bones mentioned, and when the foot was placed in plantar flexion occurred in all cases. The opposite position, maintained, relieved it. This has been termed by the author as "scaphoid pain".

Of the fifteen cases five were seen originally, and lost an average of nine days from work. Ten cases were referred or seen in clinic after having been diagnosed and treated elsewhere with bandages, etc., as a sprained ankle. The average time lost in these cases was twenty-four days. One had been given a plaster case needlessly and was incapacitated for forty-seven days.

Prolonged immobilization is unnecessary as bony union of the detached fragment rarely results, it being too small to form any callus. A firm fibrous union occurs, reuniting the ligament to the tarsal bone to which it is attached.

V. W. MURRAY WRIGHT

SUMMARY

(1) A definite sprain-fracture of the tarsal bones, particularly the scaphoid, is noted.

(2) It occurs most often in females wearing high-heeled shoes after falling on stairs, inverting and hyperextending the foot.

(3) It is best treated by flexion of the foot maintained by anterior "stirrup" adhesive straps; the use of low-heeled Oxfords temporarily, and an ankle support if necessary.

(4) The majority of cases are diagnosed as sprains with a consequent lengthened disability for the patient.

(5) X-ray films should be examined personally when possible.

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TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY

Stated Meeting Held December 5, 1927

The President, DR. CHARLES F. MITCHELL, in the Chair

HÆMOPHILIA IN AN ADULT

DR. PAUL A. LOEFFLAD, by invitation, presented a man, aged forty-four, from the Surgical Service of Dr. Alfred C. Wood at the Philadelphia General Hospital, who was admitted November 7, 1926, complaining of pain and swelling of the right hand. Two weeks before admission he had struck the little finger of the right hand, resulting in an infection which involved the hand and forearm. Hot applications of magnesium sulphate were applied and the infection subsided without any incision, which was delayed due to his hemorrhagic disease. Physical examination revealed several lacerations of the scalp resulting from previous injuries. There were many missing teeth and the remaining ones were carious. Examination was otherwise negative, except for a small mass in the left inguinal region. The external abdominal ring on the left side admitted the examining finger and an impulse was felt upon straining. A blood count revealed: hæmoglobin, 80 per cent.; red corpuscles, 3,500,000; white blood corpuscles, 10,000. A differential count: polymorphonuclears, 59; lymphocytes, 29; transitionals, 4; eosinophiles, 8 per hundred cells. Coagulation time, 12 minutes; bleeding, 2 minutes; platelet count, 30,000. Blood sugar, 118; urea, 14; uric acid, 3.4 per hundred mg. of blood. Wassermann negative. For one week before operation Ceanothyn in four dram doses was administered by mouth every 4 hours. After four days the coagulation time had fallen from 12 to $8\frac{1}{2}$ minutes. On the day previous to operation 500 c.c. of citrated blood was given intra-abdominally. The coagulation time on morning of operation was 6 minutes and the bleeding time 2 minutes. December 15, the left direct hernia was operated upon following the Bassini technic under open-drop ether anæsthesia. On the day following the operation 500 c.c. of citrated blood were again given. The patient developed a large hæmatocele post-operatively, but otherwise there was no bleeding or other complication. He was discharged January 26, at which time the coagulation time was 7 minutes and the bleeding time 2 minutes.

The patient was readmitted October 14, 1927, with a large bleeding wound of the scalp and pain in both knees. While sleeping in a cot he had fallen to the floor, striking his forehead and both knees. Examination revealed a lacerated wound of the right side of the forehead and swelling, pain and limited motion of both legs. Considerable difficulty was encountered in attempting to arrest the bleeding. Parathormone, 1 c.c. intramuscularly, was administered daily, which lessened the amount of oozing. Tight bandages were applied to the knee-joints in preference to tapping for fear of more hemorrhage. After a week of oozing from the scalp wound, the bleeding subsided. There was considerable limitation of motion in both knees upon discharge. X-ray of both knees revealed no changes in the bony structures. The coagulation time on admission was 12 minutes and on discharge 10.

At the present time there is full motion of the left leg with some limitation of flexion and extension of the right leg. There is also a small mass about the size of a walnut in the left scrotal sac, just above the testicle, which is probably an organized blood clot, the remains of the hæmatocele. There is no evidence of recurrence of the hernia. The family history of this patient shows that one brother died following a nephrectomy. He was also a bleeder. A sister has one son now under treatment for hæmophilia while another sister has lost a son following a circumcision. The patient's own history is that he has been admitted ten times to the Philadelphia General Hospital suffering either from lacerations or hæmatomata. Twice he was admitted following the extraction of teeth with resulting uncontrollable hemorrhage. Another time he was admitted with an incarcerated hernia. At the time of admission there was no evidence of obstruction or gangrene of the incarcerated loop, so that it was deemed advisable, in view of the hemorrhagic disease, not to interfere surgically. At present he has still a slight oozing from his scalp wound whenever the dressings are changed.

UNDESCENDED TESTICLE—TOREK OPERATION

DR. K. P. A. TAYLOR, by invitation, presented a patient, a negro boy, aged five, from the Surgical Service of Dr. A. C. Wood, at the Philadelphia General Hospital, with an undescended testicle. The first stage of an operation for its correction had been done six weeks before. The procedure used was that devised by Torek and later used by Willy Meyer and others and described by Meyer in *Surgery, Gynecology and Obstetrics*, January, 1927. The operation differs in no way from the Bevan operation, except in so far as the measures undertaken for the control of contraction of the cord and testicle post-operatively. The usual hernia incision is made with dissection of the vas and cord, with complete separation of the blood-vessels of the cord from the surrounding fascia; by way of retention of the testicle, an oblique incision is made in the undeveloped half of the scrotum and another corresponding incision through the skin of the thigh, exposing the fascia lata. The posterior margins of these two incisions are united by interrupted sutures. The anterior margins of the wound are closed so that the testicle is covered in a pocket and secured to the fascia lata. The testicle appears to be in the scrotum. Special precautions were taken to avoid soiling; an indwelling catheter being used and the wounds sealed with collodion. Moskowitz reported the end results of 405 cases of undescended testicle and expressed disappointment with the end results secured. The operations were conducted according to the principle of Bevan; in some cases, the vessels of the cord, with the exception of the artery accompanying the vas itself, were dissected in order to permit the necessary lengthening of the cord. Coley in a paper two years ago expressed disappointment with the end results of the operation. The operation under discussion devised by Torek has been employed in 64 cases reported from the Lenox Hill Hospital in New York with satisfactory results. The speaker regarded Doctor Meyer's conclusions as ambiguous, in that he states that all the patients were satisfied with the results obtained and yet he admits that only 35 cases were followed to a logical conclusion. The results in these cases, however, were satisfactory. This is a higher percentage than usual. Meyer thinks that the second stage of the operation should be undertaken five or six months after the first. It is his opinion that from three to five months are necessary to insure the cord against final retraction.

UNDESCENDED TESTICLE—TOREK OPERATION

DR. JOHN H. JOPSON remarked there is no reason to be dissatisfied with the results of the Bevan operation in the majority of cases. The speaker has been following the development of this operation for a number of years and has been amused by the change of ground taken by certain men as to the finer details of the operation. He considered it a mistake to divide the spermatic artery and vessels of the pampiniform plexus before puberty, when everything would seem to indicate the necessity for conserving the blood supply. One very necessary step consists in lengthening the cord by anatomical dissection and severing of all the fasciæ included in it. Davidson advised following the vas deferens into the extraperitoneal space, and abolishing its curve over the peritoneum. A still more useful development was the contribution whereby the spermatic artery was followed up and freed behind the peritoneum, its shortness being the main obstacle to bringing the testicle down. There have been very amusing suggestions for correction by traction, such as a suture through the testicle and scrotum with a rubber band attached to it and attaching the rubber band to a child's toe so that constant traction would correct the condition. Any attempts to retain the testicle in position by suturing it to the bottom of the scrotum are futile, unless the cord has been properly lengthened. In only a few cases has it been found impossible to bring the testicle well below the spine of the pubes. If it is gotten there and if the external ring is made small enough, it will stay outside the canal.

DR. A. P. C. ASHHURST remarked that no one has mentioned Ombredanne's operation. This procedure is popular in France but is not followed much in this country. It is based on the principle that if the mountain will not go to Mohammed, then Mohammed must go to the mountain. It consists of an inguinal incision and dissection, as usual, and then the making of an incision in the opposite side of the scrotum, and drawing the testicle through this buttonhole to the other side of the scrotum. The testicle is fixed to the septum, and the opening in the septum is reduced in size by sutures, so that the testicle will be unable to draw back again. If the testicle will not reach the scrotum, the scrotal septum is pulled up to the testicle at the external ring; but gradually the testicle is drawn down during convalescence. If the condition is bilateral, then the right testicle is placed in the left scrotum and the left testicle in the right scrotum. The speaker never had much success with the ordinary operation, in making the testicle stay down where it belonged, but since using Ombredanne's method he has found the testicle stays well down in the scrotum. Doctor Ashhurst has done the double operation upon one patient only, but the testicles seem to be staying down nicely. The patient and his parents are entirely satisfied with the result. It is a simpler operation than the method described by Doctor Taylor, being done at one sitting; and as far as he knows the procedure has been found to accomplish the desired result.

DR. K. P. A. TAYLOR remarked that Doctor Meyer in reporting his cases pointed out that the operation was not to be considered one of traction.

PHILADELPHIA ACADEMY OF SURGERY

Keetly had described a similar incision several years before, using a longitudinal instead of an oblique incision and suturing the testicle to the fascia lata under tension. In the present instance, emphasis was placed upon the importance of very high dissection of the cord, complete separation of the vas from the spermatic vessels and pursuit of the vas as close to its termination as possible and following of the vessels of the cord to at least two and one-half or three inches retroperitoneally—as far as could safely be accomplished. This is not in any sense an attempt to lengthen the cord by traction; it is simply an attempt to hold the testicle in place until such time as the structures become accustomed to their new position.

DEFORMITIES OF THE MANDIBLE

DR. ROBERT H. IVY presented two patients with deformities of the mandible.

CASE I.—A boy, fourteen, who when eleven months old fell out of a baby coach, after which it was seen that he had bruises on the left side of



FIG. 1.—Profile view before operation showing retrusion of skin.



FIG. 2.—Deviation of chin to left.

the face. An abscess developed in the temporal region shortly after the accident, but no bone was exfoliated. As he has grown older his parents have noticed that his lower jaw has not grown straight.

Examination on November 30, 1926, showed with the mouth closed, a deviation of the chin to the left side, with a rounded appearance of the left side of the face and flattening of the right side. (Fig. 2.) The upper front teeth protruded far in advance of the lower, and the chin was markedly

DEFORMITIES OF THE MANDIBLE

retruded. (Fig. 1.) The patient could open the mouth to about the normal extent, indicating no lesion of the mandibular joint, but the whole lower jaw and teeth swung toward the left on opening. (Fig. 3.) The distance from the left mandibular condyle to the symphysis menti was about 2 cm. less than that from the right condyle to symphysis. The X-ray showed no evidence of a lesion of the condyle. The left ascending ramus appeared to be thicker and shorter than normal.

The appearance of the boy's face was typical of that seen in cases of unilateral ankylosis of the mandibular joint occurring in early childhood. The absence of ankylosis made probable a diagnosis of old fracture of the left ascending ramus somewhere below the joint with shortening and good union. This case bears out my observation that ankylosis is only to be feared in fractures involving the joint and head of the condyle, and that in fractures through the neck of the condyle and below, it is unnecessary to take any steps to avoid ankylosis, although with union, lateral deviation of the chin from shortening may occur.

The problem in this particular case was to lengthen the left side of the mandible bringing the chin to its normal position forward and medially, and by this at the same time to correct the malrelationship of the lower dental



FIG. 3.—Deviation of jaw to left on opening mouth.

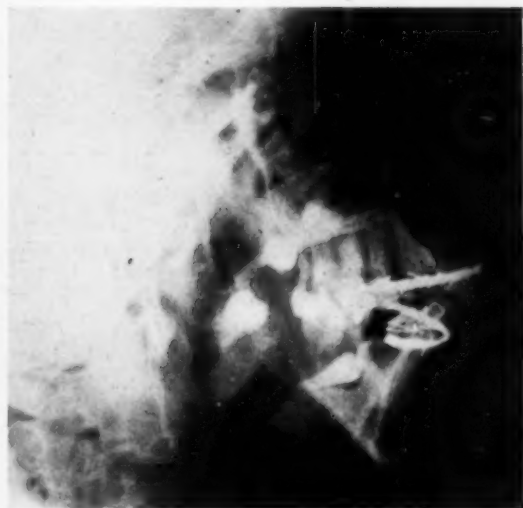


FIG. 4.—Radiograph showing gap in mandible after osteotomy.

arch with the upper. This was accomplished by section of the left side of the jaw, allowing the chin fragment to be drawn forward, and subsequent filling of the gap thus produced by means of a bone graft. The first molar teeth having been previously lost by caries, this edentulous region seemed to be the most favorable site for the section. Before the operation, wire arches were attached to the upper and lower teeth to provide for fixation in the corrected position. December 10, 1926, under ether anaesthesia, small skin incision was made at the left lower border of the mandible beneath the first molar

region, and a Gigli saw was introduced on the lingual side of the bone until one end protruded into the mouth. By this saw the bone was divided vertically, thus permitting the chin to be pulled forward and to the median line,

bringing the teeth into approximately correct occlusion. The teeth were then fixed in occlusion by means of wires connecting the upper and lower arches. The external incision healed by primary union. After twelve weeks of fixation in this manner the mucous membrane had thoroughly healed over the site of the osteotomy and the X-ray showed a gap of 2 cm. in the mandible caused by drawing forward the chin. (Fig. 4.) March 11, 1927, under ether-oil colonic anaesthesia, the gap was exposed by an incision beneath the border of the jaw, the bone ends were freshened and three flexible strips of osteoperiosteal graft from the left tibia were laid between the fragments. The wound was closed without drainage and healed with no complications. (Fig.



FIG. 5.—Profile after operation. Chin has been drawn forward.



FIG. 6.—Chin restored to median lines.

7.) Union was found to be complete in 12 weeks and the wire fixation was removed from the teeth, which then maintained their proper relations. The chin stayed in its forward and median position (Figs. 5 and 6), and there was no interference with opening and closing of the mouth. There remained a flattening of the right side of the jaw, which was made more symmetrical by laying over its outer surface a strip of osteoperiosteal graft from the right tibia, on July 8, 1927. Examination at the present time shows great improvement in the appearance of the face and in the relationship of the teeth for mastication. Further correction of the malocclusion can be brought about by orthodontic means.

Particular attention to the correction of this type of deformity has been given by V. P. Blair and V. H. Kazanjian in this country, and by A. Limberg, Leningrad, A. Lindemann and C. Bruhn, Dusseldorf, and H. Pichler, Vienna.

CASE II.—A man, twenty-eight, July 20, 1924, met with a very serious automobile accident, sustaining comminuted fractures through the body of the mandible on both sides. Loss of bone by sequestration left ultimate healing with about 2.5 cm. loss of substance on each side. During the period

DEFORMITIES OF THE MANDIBLE

of healing, collapse of the symphysis was prevented by fixation of the upper and lower teeth with interdental splints. This part of the treatment was carried out by Dr. Joseph D. Eby, of New York. In August, 1925, he had a double iliac grafting operation in New York. The graft on the left side exfoliated, while that on the right underwent some absorption and did not bring about union.

On May 20, 1926, examination showed the symphysis portion of the mandible to be freely movable, with a gap in the left side of the body about 2.5 cm. long. On the right side the X-ray showed the partly absorbed remnant of an iliac graft without union to the mandibular fragments. Even though the lower teeth were held in relation to the upper by splints, some retrusion of the chin was visible externally owing to slight backward displacement and to atrophy of overlying soft tissues. Hollows in the soft tissues were also visible externally over the ascending ramus on each side.

May 21, 1926, under ether-oil colonic anaesthesia, through a skin incision beneath the lower border of the mandible on the left side, the gap in the bone was exposed, the ends of the bone fragments were freshened and a graft from the crest of the left ilium was laid in the defect, with its ends in good contact with the mandibular fragments, being attached to the latter by means of soft brass wire sutures. The wound was closed without drainage. On the right side, a similar incision was made and scar tissue over the remnants of the old iliac graft and the mandibular fragments was dissected out, exposing fresh bone surfaces. The partly atrophied graft was not removed. The fresh bone surfaces were then



FIG. 7.—Radiograph showing gap in bone filled by osteoperiosteal graft.

overlaid with three strips of osteoperiosteum from the right tibia, and the wound was closed in two layers without drainage. Doctor Eby's splints were left in position for three months, fixing the upper and lower teeth together. At the end of this time firm bony union was found on the right side. On the left side some motion was still present at the posterior end of the iliac graft and the latter was reinforced by a strip of osteoperiosteum from the left tibia, laid over it. After two more months of fixation by the interdental splints, the latter were removed and firm union on both sides was found. The function of mastication was quickly restored as motion was permitted. There still remained the retrusion of the chin and the hollows over the posterior portion of the mandible. In November, 1926, the prominence of the chin was restored by a piece of costal cartilage suitably shaped and inserted in contact with the anterior surface of the symphysis through an incision just beneath the point of the chin. Uncomplicated healing followed. February 25, 1927, the hollows over the ascending rami were plumped out by embedding strips of fascia lata from the left thigh into subcutaneous pockets.

The nature of this man's occupation (life insurance) demands a good personal appearance. Though perhaps physically able to gain a livelihood after union of the mandibular fragments, it was only after the cosmetic chin operation that his morale was sufficiently restored to enable him to return to his work with full confidence.

The case is somewhat unusual in that we were obliged to transplant tissue from four different sources.

MASSIVE COLLAPSE OF THE RIGHT LUNG FOLLOWING NEPHRECTOMY FOR LEFT-SIDED HYDRONEPHROSIS

DR. LEON HERMAN reported the case history of a lad of seventeen years, who had an initial attack of left-sided renal colic three years ago. Since that time he has had six attacks, the last one June, 1927. He was admitted to the Pennsylvania Hospital, September 22, 1927. There has never been gross hæmaturia. A cystoscopic examination was made on the day of admission with the following findings:

The urethra is small, admitting only a Number 18 F. scope. The bladder is tolerant and of large capacity. There is a deformity of the trigon which in the absence of scarring is in all probability of congenital origin. The left urethral orifice is normal in appearance but is small and displaced upward and to the left. The right ureteral orifice is in the midline of the bladder. The vesical mucosa is normal throughout. The interureteric bar is greatly thickened and there is marked generalized trabeculation present. There is an extraordinary deformity of the outlet due to the intravesical invasion of the prostate gland. The cystoscopic appearance of the sphincteric margin is that of an aged man with marked benign hypertrophy of the prostate—there being a deep anterior cleft but no signs of median bar of lobe formation. The gland by rectum is small, soft and smooth. A Number 5 catheter met with an obstruction at the level of the left uretero-pelvic junction. This was easily overcome and the catheter entered a large hydronephrotic sac from which 160 c.c. of clear urine was aspirated but the sac was not emptied. This urine was normal and sterile. The differential functional studies showed a faint trace of the dye in sixteen minutes and less than five per cent. in one-half hour. The right kidney was normal and apparently supporting life unaided. Following this instrumentation which included the production of a pyelogram, the patient developed abdominal pain and distention, a large tender mass in the region of the left kidney, fever, leucocytosis and vomiting. The pyelogram had been made after injecting 75 c.c. of twenty-five per cent. sodium iodide solution, the strong solution having been used in the belief that it would diffuse through the contents of the sac and give a more detailed picture. September 26 a catheter was introduced into the left kidney and ten ounces of cloudy bloody fluid aspirated. This contained forty-five pus cells to the high power field and a non-hæmolytic staphylococcus was cultured from the fluid. The catheter was retained in the kidney for several days for drainage and the patient rapidly improved.

October 1, nephrectomy was performed under ether anaesthesia. The pre-operative diagnosis of hydronephrosis due to an anomalous vessel crossing the ureter was not confirmed, but the upper ureter crossed a band of fibrous tissue which in all probability contributed to the obstruction. The patient was cyanotic from the outset, and when the adherent kidney was freed from the discharge and opened during the procedure the condition of the patient became alarming. The operation was completed quickly and after stimulation with atropine and subcutaneous salt infusion he reacted. After being kept in the operating room for one hour after the conclusion of the operation, conditions were entirely satisfactory. The convalescence was uninterrupted until October 3, when the patient complained of pain in the right chest and dyspnoea. There was some cough with blood-tinged sputum and it was found that expansion of the right chest was very limited. The physical examination revealed consolidation of the right lung and hyperresonance of

OPERATIVE RELIEF OF EXTRA-UTERINE PREGNANCY

the left one. The heart was displaced far to the right. X-ray examination confirmed the clinical diagnosis of massive collapse of the lung. The patient was treated expectantly; no bronchoscopic examinations or treatment being employed. Recovery was uneventful and the patient was discharged November 1. X-ray examination at that time showed the lung to be normally expanded.

DR. C. F. MITCHELL said that it is always a grave question in such cases whether or not to use the bronchoscope. It is a temptation to leave them alone in the hope that they will get well, but there is no doubt that they are benefited by bronchoscopic treatment and recover sooner if this sticky mucus is removed.

DR. D. B. PFEIFFER said that Sante, of St. Louis, recently reported that he had been successful in clearing up collapse of the lung by the simple expedient of rolling the patient onto the unaffected side and having him cough. In several cases reinflation of the collapsed lung occurred within a few minutes in very dramatic fashion. This is a simple measure, almost always practicable and is worthy of extended trial. It is noteworthy that the atelectasis in Doctor Herman's case occurred on the contralateral side from the lesion which seems to be the invariable rule in operations upon one kidney. The significance of this seems to lie in the fact that collapse occurs in the dependent lung; the operative and frequently the post-operative posture being the lateral one. Scott and Joelson, in the last issue of the *Archives of Surgery*, have reported a case in which massive collapse occurred in the same patient following successive operations for bilateral renal calculus. In each case collapse developed in the dependent lung. Whatever influence may be ascribed to nervous reflexes in the development of this curious condition, it is certain that the dependent position favors both venous and capillary congestion and bronchial occlusion by retained secretions. The reverse position, therefore, has much to recommend it in both prevention and cure.

OPERATIVE RELIEF OF EXTRA-UTERINE PREGNANCY

DR. HENRY P. BROWN, JR., read a paper with the above title, for which see page 581.

DR. JOHN M. FISHER said that very early in an ectopic pregnancy, as early as four weeks, blood can be found extravasated into Douglas' pouch; and when in doubt as to diagnosis an incision can be made in the posterior cornu, and if blood is found, it is a strong evidence of the existence of ectopic pregnancy. Another thing to which Doctor Brown did not call attention is the tenderness of the cervix which is found as a rule in cases of unruptured ectopic pregnancy. Quite frequently, we find such a condition present at the third or fourth week. Another feature is that pulsation of the uterine artery on the pregnant side is much more distinct than on the opposite side. Since accurate diagnosis of the location of rupture cannot be made, Doctor Fisher feels that the best thing in ruptured extra-uterine pregnancy is to do an immediate operation. Regarding the giving of blood transfusion or intravenous injections before operation, he thinks this is a mistake; if there

PHILADELPHIA ACADEMY OF SURGERY

is a bleeding point in the abdomen, the vessels are filled the more the bleeding increases. If given at all, the best time is just before operation is begun and then by the time the surgeon gets into the abdomen, the transfusion will have been given without detriment to the patient. As to leaving blood in the abdomen following operation, this is quite the proper thing to do. It avoids unnecessary delay in getting the abdomen closed; the sterile blood is absorbable and aids in the patient's recovery.

HARELIP AND CLEFT-PALATE

DR. WARREN B. DAVIS read a paper entitled "A Study of 425 Consecutive Harelip and Cleft-Palate Cases," for which see page 536.

Dr. R. H. IVY said that his experience with this work is limited as compared to the essayist, covering not more than a hundred cases. He can recall at least three colored children in his series, as compared to only one recorded by Doctor Davis. This is accounted for by the fact that most of his work has been done at the Polyclinic Hospital, where a large proportion of negroes are seen. Doctor Davis brought out an interesting observation bearing on heredity, which the speaker had not seen mentioned elsewhere, viz.: the large proportion of cases where collateral members of the family lacked maxillary second incisors. Doctor Davis mentioned three cases in his series in which the lip and palate cleft was accompanied by pits in the lower lip. The speaker has observed these in at least a dozen cases. Enlarged thymus is not infrequently found in babies with clefts of the lip and palate, and of course adds to the operative risk. Attention is called to this in a recent paper by J. A. HENSE, of Omaha, in the *Journal of American Medical Association*, November 12, 1927, page 1666, who advocates routine X-ray examination for this condition. Pre-operative X-ray examination for enlarged thymus in cleft lip and palate cases is also routinely carried out in the clinic of Lyons, of Ann Harbor. One enlarged thymus has occurred in the last four cases in Doctor Ivy's clinic.

Regarding the technical procedures, the time of operation suggested by Doctor Davis for the various types of deformity is in accord with the general opinion, i.e., to close the anterior part of the cleft in the lip and alveolus before three months of age, and the posterior part from eighteen months to two and a half years of age. Closure of the lip alone in most cases will take care of the cleft in the alveolar process without making a greenstick fracture or putting wire through this portion of the bone. If extreme care be not used in bringing back the protruding premaxilla, either in single or double cleft, it is apt to be carried too far back, with resulting flat upper lip. Where a V-shaped piece of the vomer is removed in double cleft with protruding premaxilla, rotation is apt to cause the incisor teeth after eruption to project backward instead of downward and slightly forward. The speaker prefers to slide the protruding bone downward and backward without rotation. He has not found that on-end mattress sutures for the mucoperiosteum of the hard palate cause sloughing, but rather favors union by bringing broad

HARELIP AND CLEFT-PALATE

raw surfaces together. In bringing the horizontal bony plates of the palate together, the speaker wished to ask how the holes through the bones for introduction of the wires were made.

DR. W. B. DAVIS remarked that there are many points which show the individual differences in operative technic. Doctor Ivy's experience with the mattress sutures differs from his; also the different types of cases in the two series. In regard to rotation of the premaxillary bone, the speaker is careful not to remove too large a section and estimates the base of a triangle just sufficient to allow the rotation necessary. In one case seen several years ago, in which an attempt had been made to repair the lip deformity, the incisor teeth were going through the upper lip; that is the other extreme. The suture through the bony flaps is another advantage in the two-stage operation. Some years ago Doctor Davis tried the method of Rowe who advocated operation in one stage; he had little drills and put the sutures through with small straight needles and a specially devised needle holder. It is surprising how much these pieces of bone soften up in one week, as shown by the two-stage operation. Now the speaker uses a curved needle and carries the wire through from one side and catches it with a specially devised hook like a crochet needle on the opposite side.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY

Stated Meeting Held December 14, 1927

The President, DR. FRANK S. MATHEWS, in the Chair

EMPYEMA FOLLOWING PNEUMOTHORAX THERAPY FOR TUBERCULOSIS

DR. HAROLD NEUHOF presented a man, forty-six years old, who had been the subject of a widespread pulmonary tuberculosis of the right side that began seven years ago. Pneumothorax therapy was employed for two and a half years. The patient did very well; the sputum became scanty and free from tubercle bacilli and he has remained apparently well of his tuberculosis up to the present time. About three years ago there suddenly began severe pain in the right chest and the expectoration of a large amount of pus. Since that time the sputum was profuse, averaging about two cups daily, not foul, and was brought up with very little effort. About three months before he came under the reporter's observation, he had some grippelike manifestations, since which time the sputum has become more profuse and thicker. It then became necessary for him to empty the cavity by leaning over the bed three or four times a day. There was vomiting with cough efforts. The patient could not lie on his left side and there was progressive deterioration in his general condition with loss of about ten pounds in weight. Sputum examined now, as before, was negative for tubercle bacilli.

When the patient came under observation, June 15, 1927, he was obviously considerably emaciated, had slight dyspnoea, and was constantly coughing with the expectoration of pus. Examination of the chest showed pronounced retraction of the right side with almost imperceptible respiratory excursion. Percussion note was flat throughout. An X-ray plate of the chest showed the heart and trachea drawn over to the right side; no evidence of pulmonary involvement on the left, and the dense parietal shadow of a chronic empyema cavity. The empyema reached from the base of the mid-axilla.

The first operation, performed soon after the patient had been seen, consisted in the free resection of two ribs over the axillary portion of the empyema with widespread freeing of the parietal membrane. This was dense, greatly thickened, fixed, but could be separated from the inner surface of the ribs by sharp and blunt dissection. After it had been freely mobilized, a considerable dead space remained. It was filled anteriorly by a flap made from the pectoralis major and posteriorly by a flap made from the latissimus dorsi. The soft parts and skin were sutured without drainage.

After this operation, the amount of sputum rapidly diminished, and at the time the patient was discharged from the hospital, one month after operation, the sputum was greatly reduced in amount. He did well for a while, but in about another month more profuse expectoration of pus began and the daily amount increased progressively, although it never reached the quantity that existed before operation. The patient was therefore re-admitted to the hospital four months after the first operation. Lipiodol was injected into the empyema cavity and demonstrated that the space was smaller than that pre-

RECURRENT CARCINOMA OF CHEST WALL

viously existing, but also showed a free communication with the bronchial tree.

At the second operation, it was determined to attempt a wide resection of the parietal membrane. Obviously all could not be removed, but at the same time it was thought a free removal would offer the best outlook for an approximation between the soft parts of the chest wall and visceral membrane. Operation was performed under local anæsthesia about five months ago. It consisted in a vertical incision carried across the pectoralis major and down toward the mid-axilla. Large sections of the third, fourth and fifth ribs were removed. The dense parietal membrane, widely exposed, proved to be an inch or more in thickness and was resected down to a thin shell of more pliable tissue directly upon the empyema cavity. The cavity itself was entered in several places. The result of this excision was a flapping membrane capping the empyema cavity. Into the space left after excision of the pleura, the margins of the divided pectoralis major were turned. Soft parts and skin were closed.

The patient did well for three days after operation and then began to run temperature with increasing pulse rate and dyspnea. He was treated with the tentative diagnosis of pneumonia. After ten days temperature gradually subsided, and the sputum that had already greatly diminished in amount was reduced to a half to one ounce daily. In another two weeks the sputum was very scanty, and then completely disappeared. There has been no return of purulent expectoration up to the present time. Considerable serum accumulated in the dead space of the wound and this was treated by repeated evacuation and compression dressings. The soft parts gradually were drawn in to fill the dead space, so now there is a deep depression in the operative field. The patient has gained gradually in weight and strength, feels well and has returned to his occupation.

RECURRENT CARCINOMA OF CHEST WALL FOLLOWING MASTECTOMY. RESECTION OF CHEST WALL WITH FASCIAL GRAFT FOR THE PLEURAL DEFECT

DOCTOR NEUHOF presented a woman, fifty-eight years of age, who eight years ago presented a typical recurrent carcinoma of the chest wall at the mesial end of an operative scar. The operation had been done ten years before, and although data could not be obtained, it had obviously been a radical one for carcinoma. The mass was sessile; the overlying skin adherent; it was about one and a half inches in each diameter and fixed to the chest wall. The second and third ribs and the intercostal tissues near the costochondral junctions were involved. At operation, under intrapharyngeal anæsthesia, the second and third ribs were divided beyond the lateral aspect of the tumor. The parietal pleura was stripped away toward the tumor and was then found to be adherent to the deep surface of the neoplasm. The free pleural cavity was therefore entered and the chest wall freely sacrificed around the neoplasm. The internal mammary vessels were secured above and below, and the removal of the portion of the chest wall bearing the tumor was completed by carrying the dissection through the second and third rib cartilages. A sheet of fascia lata about three inches in each diameter was detached from the thigh and fixed into the pleural gap by four sutures of fine catgut. Continuous sutures then approximated the pleural margin to the margin of fascia. As the last sutures were placed, the intrapharyngeal pressure was increased in order to bring the lung up to the surface. A wet compress was

then placed over the graft in order to control any air leakage that might occur. The skin was then freely mobilized and carefully closed as the wet compress was withdrawn.

There was no air leakage and no pneumothorax after operation. This was confirmed by a series of post-operative X-ray pictures.

The patient has remained well since operation. There has been no interference with pulmonary mobility. A recent X-ray examination of the chest was negative. The operative field is occupied by mobile skin overlying a rigid membrane continuous in contour with the chest parietes. On coughing or straining this membrane is resistant and does not bulge.

DR. JOSEPH WIENER said that twenty-two years ago he amputated the left breast of a lady for carcinoma and she remained free from the disease for ten years. She then came back with a scirrhus carcinoma of the other breast, far advanced. It was removed but there was recurrence in the scar within a month and this included the chest wall. The case seemed hopeless but the speaker did a radical secondary operation and during the eleven years that have since elapsed she has remained entirely free from any further recurrence.

INFECTED CONGENITAL CYST OF LUNG IMPROVED BY MARSUPIALIZATION AND DRAINAGE

DOCTOR NEUHOF presented a woman, thirty years old, who came under his observation at Montefiore Hospital one and a half years ago. The history was of a year's duration with slight cough and expectoration. These manifestations continued for six months. There then occurred a sudden onset of fever, chill, pain in right chest and more active cough with more profuse expectoration. A diagnosis of right-sided pleurisy was made. Fever and other manifestations continued for a few days and then the acute symptoms subsided. For six months, however, there has been almost continuous cough with expectoration of small quantities of mucopurulent sputum. On admission to the hospital the appearance of the patient suggested suppuration of long standing. There was a large area of dulness to percussion in the lower right chest posteriorly with almost absent breathing. These physical signs suggested an empyema near the mediastinum. The X-ray picture disclosed a dense homogeneous shadow in the lower right chest arising broadly from the region of the mediastinum. This free margin was smooth and globular, and those who saw the plate believed the condition either a mediastinal abscess, or an empyema at the mediastinum. An aspiration was done and purulent material was withdrawn, which was found to be sterile on culture.

The first operation was performed on June 1, 1926. Under local anesthesia, sections of the eighth and ninth ribs close to the midline were freely removed subperiosteally. The pleura was stripped away in order to enter the mediastinum. The latter was exposed with negative findings. It was, therefore, assumed that the lesion was an encapsulation of pleural pus. No adhesions were noted through the unopened pleura, the lung surface moving freely. On the assumption of a lung abscess, the pleural cavity was opened and the surface of the lung examined. A well-defined hemispherical bulge of the lower lobe was then noted. This part of the lobe was packed off from the remainder of the pleural cavity and the wound packed. Aspiration was done and pus obtained. Spreads and cultures were again found to be sterile.

LOBECTOMY FOR BRONCHIECTASIS WITH BRONCHIAL FISTULÆ

At the second stage operation, eleven days after the first, the lung was freely entered until pus was encountered at a depth of about an inch. A large amount of pus was withdrawn by suction, and it was then found that the cavity, occupying a good part of the lower lobe, presented an absolutely smooth wall. Part of this was excised for diagnosis. Digital exploration of the cavity disclosed the wall of a bronchus on its mesial aspect. The rings in the bronchial wall could be felt through the thin overlying membrane of cyst wall, but there was no direct connection between the bronchus and cyst. The lung at the site of entry into the cyst was sutured to the soft parts of the incision in order to bring the cyst nearer the surface. A tube was inserted.

A microscopic examination of the wall of the cyst showed it to be lined by ciliated epithelium of bronchiogenic character.

The immediate post-operative course was satisfactory. There was gradual diminution in the amount of the secretion and shrinkage in the size of the cyst, as determined by measuring the fluid and by filling it with sodium bromide solution and X-raying thereafter. Cough and sputum have entirely disappeared. General condition progressively improved. The cavity now holds ten to fifteen cubic centimetres of fluid and a fine tube is left in place as a safety valve.

LOBECTOMY FOR BRONCHIECTASIS WITH BRONCHIAL FISTULÆ

DOCTOR NEUHOF presented a woman, now twenty-five years old, who had had a series of operations on the chest wall and lung that began when she was two years old. The first operations in 1903 and 1904 consisted in rib resection for empyema and drainage for abscess of lung. A large cavity remained and subsequent operations were apparently undertaken in order to reduce the size of this cavity. These were operations carried out when she was twelve years old, at the age of fifteen and at the ages of eighteen and twenty. At these operations rib resections were the essential part of the procedure. For many years there has been a profuse mucoid discharge from the wound, estimated at a cup or two daily. As long as the patient can remember, the wound has wheezed upon straining or coughing. Other than the usual manifestations of colds, the patient has had no cough and no expectoration. Her general health has been good and she has withstood the various operative procedures without any difficulty.

The patient first came under the reporter's observation in November, 1925. She was a well-nourished, well-developed young woman and the physical examination was negative, except for the chest condition. There was marked asymmetry of the chest with sharp scoliosis to the left of the mid-dorsal spine. There were numerous scars over the back, representing the removal of large sections of most of the ribs. The thoracic cage was almost completely gone over the left postero-lateral aspect of the chest. In the midst of scar tissue was a large triangular space covered by smooth, red, velvety, mucous membrane, broadest at the base and narrowing toward the top. This smoothly lined cavity appeared to represent an empyema space. On its mesial surface were numerous bronchial fistulæ from which air and profuse mucoid material escaped upon any straining effort. In the region of the bronchial fistulæ, cardiac pulsation beneath the velvety membrane was obvious, and the finger placed here gained the impression of an almost direct impact from the left ventricle. The X-ray of the chest showed an almost complete obliteration without any lung markings being visible. At the first operation, November 24, 1925, an attempt was made to cover the region of the bronchial

fistulæ with a skin-muscle flap. This was dissected free from the posterior part of the wound with great difficulty because of extreme vascularity. Each short incision was accompanied by active bleeding from arteries and veins, so that numerous hæmostatic sutures had to be passed. An attempt was made to mobilize the tissues about the bronchial fistulæ, but this had to be discontinued because of excessive bleeding. The skin flap was laid in place and the wound packed. The result of operation was some diminution in the size of the cavity, but no change in the local condition as far as bronchial fistulæ and profuse discharge were concerned.

The patient returned to the hospital, February 8, 1926, where an effort was made to mobilize the lung in the hope that the fistulæ could be brought to the surface in a more favorable position for a subsequent effort at closure. At this operation, an incision anterior to the gutter in the chest wall was made. Here again numerous greatly enlarged vessels in the chest wall were encountered. After securing them, long sections of two ribs that had reformed after previous operations were freely excised. Under them a dense fibrous membrane was encountered. After this was traversed, surprisingly healthy lung tissue lay exposed. The adhesions fixing this part of the lower lobe were divided, chiefly by blunt dissection. With increased pharyngeal pressure this lobe was found to balloon up in an extraordinarily free manner, as if it had only been in that collapsed state for a relatively short period of time. More separation of the lobe was carried out until the lung expanded sufficiently to obliterate a large part of the empyema cavity. The incision was then closed.

After operation, forced breathing exercises were carried out and it was found that the lung expanded enough to thoroughly obliterate the dead space. At the time of discharge from the hospital, the bronchial fistulæ were much more superficial but discharge from them was as profuse as before. The patient returned to the hospital, January 3, 1927, with the request that a radical operation be attempted in order to obtain a cure. Examination showed that the lower lobe of the lung expanded well, partly obliterated the empyema space, but that the discharge from the bronchi was quite as profuse as before.

At operation the old scar of the chest wall was freely incised upward to lay open widely to inspection the visceral surface of the cavity. There were seen a series of dilated, open-mouthed bronchi extending from the upper limit of the operative field (which proved to be the upper limit of the lower lobe) downward a distance of about 12 cm. These fistulæ could be roughly divided into two groups, an upper one, near the interlobar incisure, and the lower close to the surface of the diaphragm. A trabeculated, glistening membrane covered the surface of the lung between these fistulæ. The latter were about twenty in number. The lower lobe was densely adherent to the remains of the chest wall posteriorly and, on the mesial aspect, intimately attached to the postero-lateral aspect of the pericardium. The lobe shaded almost imperceptibly into the adjacent portion of the upper lobe. Its lower limit was almost indistinguishably continuous with the diaphragm. During the course of the lobectomy the bronchi were found dilated and thick-walled and contained muco-pus or pus.

As noted above, the first step of the operative procedure was to split open the old scar tissue in the chest wall for adequate inspection. Relatively little bleeding occurred and this exposure without any rib resection sufficed for the removal of the lung. The first step was an effort to peel away the

ANKYLOSIS OF KNEE FOLLOWING OSTEOMYELITIS

lobe from the remains of the posterior chest wall. In doing this the anterior surface of the bodies of the vertebræ were exposed and the midline was passed without gaining much mobilization. No further effort was made at freeing the lobe at this direction. The next effort was to find a separation between the lobes. This was very difficult, and lobectomy was begun with partial inclusion of the upper lobe with series of chain sutures that were placed. The procedure was to include pulmonary tissue in a stout suture, apply a clamp, and divide pulmonary tissue between clamp and suture. Such sutures were applied one after the other, working from the general region of the hilum and above the uppermost bronchial fistulæ. In this manner the upper part of the lobe could be largely detached. An effort was then made to free the lower part of the lobe. This at first could not be accomplished because no line of cleavage from diaphragm could be found. Active bleeding occurred which was only partially controlled by sutures. It was obvious that an adequate operation could not be carried out unless the lower lobe could actually be freed from diaphragm. Accordingly, another effort was made by sharp dissection, and a plane of cleavage was found through the dense cicatricial tissue that bound the lobe to diaphragm. The lobe could then be freed here, largely by blunt dissection, and the hilum was thereby freely exposed. It was intimately adherent, and could not be detached in part, from the pericardium. Therefore, a number of pedicle sutures were passed through the dense scar tissue on the posterolateral surface of the pericardium, and this portion of the hilum was thereby freed. The remainder of the hilum was transfixed by stout chromic sutures in chain series and the lobe was thereby freed and removed. Operation had been conducted under intrapharyngeal anæsthesia, which was now raised as the wound was partly closed. The pedicle sutures were left long and the wound lightly packed with iodoform gauze.

The specimen consisted of a lobe that was partly fibrous but partly aerated, traversed by thick-walled, dilated bronchi containing muco-pus. Microscopic examination showed bronchiectasis with interstitial and suppurative pneumonitis.

The immediate post-operative course was characterized by dyspnoea. This gradually subsided and the patient was convalescing on the tenth day of operation. The chronic ligatures around the pedicle disappeared by absorption and the wound rapidly began to granulate. There was no fistula formation from the bronchial stumps. The wound rapidly contracted in size, and at the time of discharge from the hospital was a clean granulating area.

It is now one year since operation. The patient has remained in good condition and the local condition is a small patch of parietal membrane that had not been removed at operation. Slight secretion occurs from this, and at some future time it may be necessary to excise this patch to permit complete closure of the wound. At no time has there been a return of any bronchial fistulæ.

ANKYLOSIS OF KNEE FOLLOWING OSTEOMYELITIS

DR. JAMES M. HITZROT presented a young woman who was admitted to the New York Hospital on September 3, 1921, when she was fourteen years old, with an acute osteomyelitis of the right femur of three days' duration. The onset was sudden and on admission the lower end of the femur and the region of the knee-joint were swollen, red and very tender. Temperature on admission was 104, white blood-cells 18,000, 88 per cent. polymorphonuclears.

At operation, September 4, by Doctor Farr, by an external incision a focus of infection was found on the posterior surface of the femur just above the external condyle. This was drained with a rubber dam. September 15, the bone focus was more widely opened, and September 18, an abscess on the inner aspect of the thigh was opened and drained.

September 29, both wounds were explored (Hitzrot) as the child's condition was not satisfactory and a large abscess had appeared over the internal tuberosity of the tibia below the knee. About half of the circumference of the lower end of the femur was white and apparently necrotic, but had not sequestered. The bone focus previously treated by Doctor Farr seemed to be draining properly. The superficial abscess was opened and drained.

Frequent X-ray examinations thereafter showed an osteomyelitis of the lower end of the femur with considerable new periosteal bone, but no evidence of sequestration up to the thirtieth day after the onset.

The cultures taken showed a pure culture of *Bacillus coli* on only one occasion (that taken at the first operation), all the others were overgrown by the *Bacillus proteus*.

Throughout this period the wounds were treated by the Carrell-Dakin method. She left the hospital, with a granulating sinus, on her fifty-sixth day, with as yet no evidence of sequestration of the exposed and apparently necrotic shaft of the femur.

Following her discharge from the hospital, the leg was allowed to become flexed to a right angle and was held in the flexed position and the child would not straighten it.

She was readmitted December 13, 1921, and the leg straightened by adhesive traction and weight. This was unsatisfactory, and on December 15, she was given an anæsthetic and the knee brought to within 15 degrees of complete extension and the leg put up on a posterior moulded plaster splint. She was discharged January 14, 1922, with the leg straight and some motion in the joint on a splint and disappeared and only had some casual treatment, the details of which they could not determine.

She returned March 13, 1922, with knee stiff and flexed to within 10 degrees of a right angle. X-ray examination at this time showed a definite change in the knee-joint with proliferative changes about the condyles of the femur. The dead bone was showing evidence of demarcation. The leg was straightened by traction and gentle manipulation under an anæsthetic and put in a circular plaster which was bivalved and she was sent to the convalescent home at White Plains, March 30.

She returned to the hospital thirty-four days later (May 3) with fever and an increase in the discharge from the outer sinus and the X-ray examination showed definite sequestration of the dead bone.

Operation: May 4, osteotomy with removal of sequestrum (5 cm. by 1 cm.) from the lower end of the femur. Vaseline gauze packing followed by Carrell-Dakin. The wound healed rapidly and she left the hospital twenty-two days later with a knee brace to control the constant tendency of the flexion at the joint.

She was readmitted August 23, 1922, with the knee in about 20 degrees of flexion and stiff. An X-ray at this time showed an ankylosis of the knee-joint with the joint space poorly defined and the cartilage apparently gone from the femur and possibly the tibia. Under anæsthesia the leg was corrected so that only about 10 degrees of flexion deformity remained and the leg was fixed in this position. The patella was united to the femur and

POST-TYPHOID OSTEOMYELITIS

considerable effort was necessary to correct the deformity. She was splinted in this position and disappeared.

Three years later, July 25, 1925, she returned to the hospital with the knee ankylosed in about 10 to 15 degrees of flexion. All the wounds were healed and had caused her no trouble since she left the hospital three years previously. At this time her age was given as seventeen. This corresponded to the appearance of her epiphyseal line in the X-ray more nearly than the age fifteen, if she was eleven years old on her first admission. The X-ray examination showed practically an obliteration of the joint with bony fusion between the patella and femur and a complete disappearance of the joint cartilages.

Arthroplasty was proposed and done, July 30, 1925, by the method proposed by McAusland, using a fascial graft from the opposite thigh to cover the lower end of the femur and reshaping the joint. The leg was put in circular plaster for five days and then in an extension splint (Thomas splint with knee attachment) and motion begun on the tenth day. She left the hospital in thirty-two days with about 20 degrees of motion in flexion in the joint. The joint was moved twice under anæsthesia and about the same motion obtained each time, but the patient meanwhile made no attempt herself to continue the motions and in the follow-up of January, 1926, was reported as unsatisfactory and the case considered closed, as she refused to return.

She returned one year later, January 26, 1927, with about 10 degrees of flexion and promised to continue treatment. Manipulation under anæsthesia was then done at repeated intervals of about six weeks and the leg flexed to about 10 degrees beyond a right angle. At present extension is practically complete, there is active flexion to a right angle and the knee is stable in the extended position with no lateral movement.

The case is shown to present the difficulties to be met with in the reconstruction of a knee-joint and the late result in what promised to be an unsatisfactory reconstruction. It is also shown to advocate the use of the method advised by McAusland which in the reporter's hands has given results much superior to other methods.

POST-TYPHOID OSTEOMYELITIS

DR. JAMES M. HITZROT presented a young man now thirty-one years old, who was admitted to the New York Hospital in May, 1915 (twelve years ago), with an ankylosis of the right knee and left shoulder following an attack of typhoid fever ten years previously (1905) when he was nine years old.

During the fourth week of the disease he developed multiple abscesses with pus in the right knee and left shoulder. After a long convalescence he recovered with the knee stiff, in about 90 degrees of flexion and a stiff shoulder. When he entered the hospital there was a bony ankylosis of the right knee well shown in the X-ray. There was also an ankylosis of the left shoulder with evidences of erosion of the head of the humerus and the glenoid fossa and a fusion of these two surfaces which was probably only partially bony. There was marked atrophy of the right leg and a definite shortening of about eight inches in measurement in the leg due to lack of growth. He could not walk because of the flexed position of the knee, which increased the shortening of the leg.

Osteotomy with resection and a correction of the deformity was done

NEW YORK SURGICAL SOCIETY

May 21, 1915, and he was discharged in plaster with the leg in the corrected position, fourteen days after the operation. The fusion became solid in eight weeks and he was able to walk with a raise of three inches in the shoe. Since that time he has led an ordinary active existence with little trouble.

November 21, 1927, he returned stating that recently his left shoulder had begun to ache after use, and the motion that he previously had was gradually disappearing due to the pain.

X-ray examination shows a progressive destruction of the head of the humerus and apparently an absorption of the bond between the humerus and scapula which possibly explains his pain and disability.

X-ray examination of the knee shows a complete bony fusion.

The case is shown to demonstrate a complicating lesion of typhoid fever with the late result in the resected knee and the untreated shoulder.

ULCERATIVE COLITIS

DR. JAMES HITZROT presented a man, fifty-three years old, who for twenty-five years had had diarrhoea, causing from three to six or more watery stools a day. The stools occurred after eating and occasionally contained a little blood and some mucus. Throughout he has had a little gas and some discomfort. His chief difficulty was the insistent desire to go to stool and his inability to control this desire. During this period he has had practically every variety of medication and colon irrigations without any relief.

In December, 1926, he had a profuse hemorrhage (intestinal) with collapse for which Doctor Carter sent him to the Presbyterian Hospital, where he received two transfusions with distinct benefit. Doctor Hitzrot saw him in consultation with Doctor Whipple and Doctor Carter and after considering the various conditions to be met, a cæcostomy with irrigation was decided upon as the best course to pursue. An X-ray at this time showed a curious mottling with spasticity. The cæcostomy was done by Doctor Whipple under local infiltration anaesthesia January 14, 1927. Irrigations of 1-10,000 and later 1-5000 acro-flavine were given through the cæcostomy wound. His general condition improved. His blood picture showed 4,000,000 red blood-cells, hæmoglobin 75, leucocytes 9200 with a normal differential after leaving the hospital.

His previous history was unimportant except for an exploratory operation fourteen years ago, in which his appendix was removed without relief. His father died at eighty-two with some condition in the colon, probably a carcinoma, and his mother died at seventy-five with kidney disease.

After leaving the Presbyterian Hospital he was given acro-violet irrigations twice daily through the cæcostomy wound and a low residue diet. For about a month he seemingly improved. An X-ray picture taken about six weeks (February 24, 1927) following his operation, however, showed essentially the same mottling and spasticity of the colon which had existed before the cæcostomy and his blood picture began to show an increasing anaemia.

He then entered the New York Hospital, where his blood picture was: hæmoglobin 58, red blood-cells 3,000,000, leucocytes 9000, with a normal differential count, and he was transfused and given 600 c.c. of blood on March 12, three days later he was operated upon.

Operation, March 15, 1927, ileo-sigmoidostomy. After opening the peritoneum and freeing the omental adhesions the colon was examined. The

ULCERATIVE COLITIS

rectum and the sigmoid flexure were somewhat thickened, but other than the thickening of the walls, it seemed to present no abnormal characteristics. The descending colon and a portion of the transverse colon were markedly thickened and when palpated seemed to contain a number of nodular masses which moved with the palpating finger. This condition existed to a lesser degree in the hepatic flexure and down to the cæcum. The only difference in the cæcal region was a rather voluminous condition with thinning of the walls as compared to the very thick walls of the ascending colon.

The small intestines seemed fairly normal, although the coils of the ileum seemed a little hypertrophied and the gut seemed a little thick as one approached the cæcum. At no point was there any definite induration nor did there seem to be any infiltration of the walls suggesting ulcer of small bowel.

The terminal ileum was matted together in the pelvis and adherent to the parietal peritoneal wall. This was liberated with a little difficulty due to the fact that the adhesions had to be separated by sharp dissection in order to free the gut. When the gut was freed and delivered, it was necessary to choose a portion of the ileum a little further away from the ileocecal valve than was ordinary, because of the raw surfaces left by the liberation of the gut from its fixed position in the pelvis.

The sigmoid flexure was also adherent on its lateral aspect by a group of rather fine non-vascular adhesions which became more marked as one ran up the ascending colon. That portion of the sigmoid which lay on the pelvic brim on the left side was then liberated sufficiently to mobilize it and brought toward the median line.

The ileum was then clamped and divided and one portion of a Murphy button placed in the open end of the proximal side. The mesentery was divided sufficiently to allow the ileum to reach the sigmoid without any tension. The other half of the Murphy button was then placed through an opening in the wall of the sigmoid. So far as could be determined through the small opening in the sigmoid, there were no polyps and nothing to indicate an ulcerative condition in the bowel selected for the anastomosis. The two portions of the button were placed together approximating the gut. The line of this approximation was further reinforced by two rows of interrupted chromic catgut stitches, and the mesentery fastened to the meso-sigmoid by interrupted catgut stitches. The posterior surface of the fossa was closed by interrupted catgut stitches crosswise, thus obliterating the space left by the rotation of the ileum. The distal stump of the ileum was then excised, leaving the stump about two and one-half cm. from the ileocecal valve and this was closed by four layers of chromic stitches, the first layer being completely through the mucous surfaces.

The stomach and gall-bladder were apparently normal except for a few adhesions in the neighborhood of the duodenum which were not disturbed. A rubber dam drain was placed to the bottom of the pelvis as there was quite a little oozing from the region from which the ileum had been removed. This oozing was serosanguineous rather than frankly bloody. A rubber dam drain was placed in contact with the raw surfaces and brought out through the lower angle of the wound. The wound was closed in layers about the drain, using five silkworm tension stitches. No attempt was made to reconstruct the abdominal wall in the region of the old operative scar, but it was closed by through-and-through sutures.

His convalescence was uninterrupted except for some irritation about one silkworm stitch which broke during removal and had to be removed later.

He left the hospital on his thirty-second post-operative day considerably improved.

Since that time he has kept up his irrigations, using 1-10,000 acro-violet at first daily, recently every second or third day and alternating them with saline solution.

Repeated skiagraphs have been taken since the colectomy. At the last one taken October 1, 1927, the barium enema filled the colon completely. The haustrations, however, were completely absent, and the colon had a smooth ironed-out appearance. There were no shadows indicative of the presence of polypi. As the barium entered the colon during the fluoroscopic examination, the transverse colon showed quite marked spasm; this was not so noticeable, however, when the films were exposed. Twenty-four hours after the enema was given the cæcum still retained considerable barium and there also was some in the ascending colon.

His improvement has been continuous and his latest examinations show a continued improvement. He has gained some weight and his general health and strength have improved. His blood picture now shows hamoglobin of 80 per cent., with red blood-cells 4,500,000. At present he has four stools a day, but the previous urgency has gone. Throughout he has carried out his own irrigations and now takes them at intervals necessary to keep the colon empty, approximately every third day.

Cultures from the stools have given no information of any value either as to the cause of the ulceration or the reason for the improvement.

This case is shown to illustrate the value of cæcostomy with colon irrigations supplemented by ileosigmoidostomy, in an obstinate case. The only new feature is the use of acro-flavine and acro-violet suggested to me by Churchman.

Doctor Hitzrot added that he had used cæcostomy with irrigation in ten cases, in nine simply the cæcostomy and in the tenth, the case shown here supplemented by ileosigmoidostomy. One case died of inanition two weeks after the operation. A second case allowed the cæcostomy wound to close as soon as the diarrhoea had ceased, his symptoms returned and he has constantly grown worse. One case was allowed to close after being free of symptoms for a year and remained well for eighteen months. Then his symptoms recurred and his cæcostomy was again established. This case has been under observation five years and is well as long as he keeps up his irrigations. Six cases are still under treatment, two cases two years, three cases one year, one case four months, and all are markedly benefited. To say cured is doubtful.

The method used is briefly as follows: A valvular cæcostomy by the Gibson method is done through a right McBurney incision, removing the appendix for microscopical examination. No facts of any importance have so far resulted from the examination of the appendices thus removed.

If a wide examination is considered desirable, exploration may be done through a rectus incision with the cæcostomy after the exploration through the McBurney incision. This is better than the use of the right rectus incision alone, because wound infection is a definite possibility and may interfere with the subsequent use of the cæcostomy and to that extent defeat the principle upon which the treatment is based. The colon as far as is possible is examined and as a rule its wall is altered in character, thick cedematous and with a generalized leathery feel. The œdema may whiten the colon so that it looks pale and anemic and does not redden upon exposure

ULCERATIVE COLITIS

to air as in the normal gut. A valvular cæcostomy by the Senn or Kader method is then done in the cæcum and a number 20 to 22 French catheter is fastened into the wound in the cæcum and into the skin. The patient is put upon a low residue diet.

The chief therapeutic measure, however, has been irrigation of the colon through the tube in the cæcostomy opening. Various substances have been used such as dilute silver solutions, dilute quinine solutions, saline, and dilute salts of mercury with varying degrees of success. At the suggestion of Churchman (personal communication) gentian violet, acro-flavine and acro-violet solutions were then substituted for the above with a greater success and a more rapid subsidence of symptoms.

At first 1-10,000 acro-flavine is used followed by 1-10,000 acro-violet. This is gradually increased in strength until 1-5000 is used daily. The quantity tolerated by each individual varies, but as a rule two quarts are readily tolerated. The frequency soon stops. If there is much bleeding tannic acid sufficient to make a half per cent. solution is added to the first quart for several days and seemingly is efficacious. At first, or until the cæcostomy wound is firmly established, the tube is kept in place constantly (about twelve to fourteen days). It is then removed and introduced daily. The patient is trained to use irrigation himself and readily learns method.

As soon as the symptoms are under control and the patient is gaining in weight, saline is substituted for the other irrigations and may be done on alternate days. Just when to allow the cæcostomy wound to close is a question. In one of these cases it has been kept open for five years as the patient's condition recurred after it was stopped.

In the cæcostomy cases the tendency of the skin opening to contract can be counteracted by allowing the tube to stay in place during a part of the day or by wearing a hard rubber obturator conveniently made from the ordinary hard rubber stem pessary, sufficiently long to enter the gut, and fastened into the wound by a piece of adhesive and worn on alternate nights for two or three days at a time.

The cæcostomy may be kept open for five years or longer. Leakage does not occur and the cæcostomy opening is readily protected by a small patch of adhesive plaster or the ordinary vaccination shield. All the patients now under treatment are back at their ordinary occupations and do not consider their irrigations of greater significance than the ordinary daily duties.

In one of his earlier cases colectomy was done for an ulcerative colitis after improvement under cæcostomy with a fatal result. He does not believe that colectomy is advisable because of its high mortality.

DR. HAROLD E. SANTEE called attention to recent literature which had come from the Mayo Clinic where experiments had been conducted which seemed to show that there is a diplococcus which is specific in the deep-lying ulcers of this condition. It apparently, however, does not account for all the cases. In the treatment of this case valvular cæcostomy was done. The speaker asked Doctor Hitzrot if he believed the irrigations brought about the good results in his case or whether a large cæcostomy might have been an important element in the amelioration of the condition by giving the colon surgical rest to some degree.

DOCTOR HITZROT replied that he had not been able to grow any organism

which could be considered specific and in his opinion there is no organism which is specific for this disease. The work of the Mayo Clinic on the cases that have had accessible ulcers is interesting, but the case shown this evening did not have ulcers in the rectum. In two of the other cases in which scrapings were made from the floor of an ulcer, no specific organism was found. With regard to cæcostomy, when this was done it was merely to facilitate giving the irrigations and not to put the colon at rest. The case presented this evening is the only one of the group in which the ileum was attached to the sigmoid. The other cases did very well with irrigations alone.

DEVELOPMENTAL MEMBRANES CAUSING OBSTRUCTIVE SYMPTOMS

ALFRED S. TAYLOR presented a young man, twenty-three years of age, with the following history: Birth at full term, vertex, instrumental delivery. Repeated vomiting and constant constipation for first three months, then vomiting stopped, but constipation has always persisted. At three years old he had sudden obstruction, distention, pain and vomiting. Ceased suddenly after twelve hours. At seven years of age a sudden obstruction, with fever and delirium lasting twenty-four hours.

All through his life there have been frequent periods of somnolence and fatigue which could be cleared up by catharsis. At twelve years of age the tonsils were removed. At fourteen years of age (1918) a gangrenous appendix was removed. Since one and a half years of age he has had chronic left ear trouble, perforated drum, deafness and recurring discharge every six months.

In 1914 (ten years of age), after great physical and nervous fatigue, he had his first convulsive seizure preceded by dimness of vision and hearing. Later attacks occurred at intervals of five to eight months until the appendix operation, after which none appeared for eighteen months, then returned to their previous schedule. Often for several days preceding an attack he would be irritable and depressed and pale, but it was not noted if the constipation was aggravated. Many attacks were followed by persistent vomiting. In playing on his school foot-ball team he has noticed for a long time that bending forward and downward would always cause vertigo and associated discomforts (mastoiditis with cholesteatoma).

Physical examination in 1920: He was a well-developed boy in good general condition. The only neurological finding was slow nystagmus to the right and rapid to the left. Teeth infected: right upper lateral incisor apical abscess; lower right third molar partly erupted and infected. The left ear showed perforated drum; some discharge, some deafness, and X-ray plates showed much involvement of the bone (cholesteatoma).

Gastro-intestinal series: Dilated stomach, elevation and distortion and angulation of the duodenal cap, adhesions between the beginning transverse colon and ascending colon; calcified glands to right of lumbar vertebræ.

Diagnosis: Epilepsy complicated by chronic toxæmia from: 1. Infected teeth. 2. Mastoiditis. 3. Digestive dysfunction due to hepato-duodenal membrane, pericolic membrane, and post-operative adhesions.

Treatment: 1. The mouth infection was disposed of. 2. The left mastoid was operated upon June 8, 1920, and a large cholesteatoma, involving the mastoid, the tympanic cavity and eustachian tube was removed with the drum

DEVELOPMENTAL MEMBRANES CAUSING OBSTRUCTIVE SYMPTOMS

membrane and ossicles. The dura was exposed, was thickened, showed no evidence of perforation and was not opened.

The third stage advised in the treatment, namely: the operative correction of the abdominal anomalies, was postponed by the parents because of the very great improvement following the above two procedures. Ten months after the mastoid operation, April, 1921, following a digestive upset with marked constipation, he had a convulsive seizure. An abdominal operation was again advised but not accepted.

During the last six years by following a careful dietary régime, by taking strenuous exercise (tennis, foot-ball, etc.) he has gotten on very well. During four college years he had only one attack which, curiously enough, occurred during vacation at home when he was not taking much exercise and the diet had been expanded somewhat. After graduating in June, 1927, he returned home to sedentary pursuits; immediately developed marked abdominal discomfort with frequent attacks of distention and pain. In August, he had a number of severe convulsive seizures, more than he had ever had in so short a period. In September, he developed iritis in the left eye. At the Neurological Institute he was again carefully studied.

Findings: Iritis, left; apical abscess of upper left lateral incisor; no evidence of organic intracranial disease; gastro-intestinal series showed same as seven years ago and more definitely indicated fixation of transverse colon to cæcum with marked distention of the intervening loop.

The incisor tooth was extracted because of its probable etiological relation to the iritis.

Again operation for correction of the digestive disturbances was urged for two reasons: 1. For improvement in digestive comfort and nutrition. 2. Since throughout his whole history there had been a very striking association between abdominal disturbance (preceding) and the onset of his attacks (following) it seemed obvious that any improvement in his abdominal condition would react favorably on the other.

Laparotomy was done October 18, 1927, at the New York Hospital through a transverse right rectus incision.

Findings: Liver normal; gall-bladder normal. First part of duodenum held up and back, close to the cystic duct, by a short rigid edge of gastro-hepatic omentum. Also there was a fold of peritoneum from the under surface of the right lobe to the outer side of the cystic duct which ran down and fused with the parietal peritoneum in front of the descending colon. These two things caused angulation and compression of the duodenum. The stomach showed no intrinsic disease. There was no disturbance of the duodenojejunal angle. The omentum had origin from the colon starting near the splenic flexure and passing around the hepatic flexure and downward almost to the cæcum. Transverse colon ran down ascending colon and cæcum to which it was firmly adherent at the old appendix stump, and then turned upward to the left at a sharp angle, the gut from the cæcum to this angulation being filled with putty-like fæces. Beyond the kink the gut was empty. The omentum was adherent to parietal peritoneum in front of the cæcum and ascending colon up to the hepatic flexure which was sharply angulated and from which a tongue of omentum, 2 cm. wide, ran up and was adherent to the anterior edge of the right lobe of the liver.

Procedure: The duodenum was mobilized by division of the edge of the gastrohepatic omentum and of the adhesion to the liver. The cæcum and

colon were mobilized by division of the various adhesions and separation of transverse colon from cæcum and ascending colon. Some of the raw surfaces could be covered, but most of them could not.

The recovery was quite uneventful. Skin sutures removed on the eighth day. On the twelfth day in a violent sneezing attack about 3 cm. of the middle of the skin incision parted. There was no infection and no separation of the rectus sheath. After the first five days he ate a liberal mixed diet, had no gas or other discomfort and had two well-digested formed stools daily, using only a moderate dose of milk of magnesia each night. Now, after two months his digestive apparatus is functioning better than ever before. He has had no attack since operation, a fact of little significance because the interval is so short.

DIFFERENTIAL SECTION OF THE TRIGEMINAL ROOT IN THE SURGICAL TREATMENT OF NEURALGIA

DR. BYRON STOOKEY read a paper with the above title, for which see page 172, vol. lxxxvii.

DR. ALFRED S. TAYLOR said that when Doctor Stookey first presented this original piece of work before the State Medical Association, Neurological Section, in 1926, he could not feel entirely sure that this refined differential section of the posterior root would give freedom from recurrence of pain. However, the experience which Doctor Stookey has had in the intervening two years has shown no recurrence of pain in any of the group he treated by this method.

The foundation of his thesis in comparative anatomy and in embryology of the human would seem to be very solid. Clinical experience thus far seems to prove that differential section answers all the needs for curing neuralgia.

It has been particularly interesting to hear this paper which apparently pushes the subject of surgical treatment of trigeminal neuralgia to perfection, especially to one who has followed the history of trigeminal neuralgia during the past thirty years. At that time Doctor Hartley was doing the best work of the period. In those early days a large osteoplastic flap was made with the aim of entirely excising the ganglion itself. This was an extremely difficult procedure and removal of the ganglion, and especially its ophthalmic third, was unquestionably the cause of the many and very serious complications, sequelæ and fatalities that have always since been associated in the mind of the general practitioner with any form of operation for trigeminal neuralgia.

The development of the posterior root section suggested by Spiller, and first carried out by Frazier, was an enormous step forward in the surgical treatment of these cases. The complications and sequelæ were greatly diminished and the mortality was reduced to almost nothing. However, eye complications were still altogether too frequent and atrophy of the muscles of the face, because of avulsion of the motor root, was very disfiguring and

PYLOROPLASTY FOR PERFORATED DUODENAL ULCER

somewhat inconvenient so that the next step in saving the motor root and finally the saving of the ophthalmic portion of the sensory root, as worked out by Frazier, were still other very marked advances in the treatment. Now, finally, with the procedure suggested by Stookey, first in 1926, after he had developed the technic over a considerable period of time, it would seem that ultimate perfection of the operation in that type of neuralgia has been reached.

In addition to the general surgical principle of not destroying any anatomical structure unless necessary, there is another strong reason for minimizing the destruction of the posterior sensory root, which is to minimize the loss of sensibility in the face. It is a common experience with patients who have been relieved of their pain by posterior root section to complain bitterly of the numb sensation of the face (and often of the mouth and tongue) which has replaced the pain. Most of the patients soon forget this numbness, but many of them do not. Therefore, it is a great advantage to have only as small a part of the face anaesthetic as is possible as long as sufficient has been done to eliminate the neuralgia.

Stated Meeting Held January 11, 1928

DR. EDWIN BEER in the Chair

PYLOROPLASTY FOR PERFORATED DUODENAL ULCER

DR. WILLIAM CRAWFORD WHITE related the history of three patients, for whom pyloroplasty for perforated duodenal ulcer had been done by him as follows:

CASE I.—Male, age twenty-nine years. Admitted November 6, 1925. Operation four hours after onset of acute symptoms. The section revealed an acute perforation of a chronic duodenal ulcer, the size of a dime, situated on the anterior surface of the first portion of the duodenum. There was only a slight amount of exudate. The ulcer was excised and a Horsley pyloroplasty was performed.

The convalescence was uneventful under routine post-operative gastroenterostomy diet. He was last seen October 11, 1927, in excellent health. He had gained twenty-five pounds in weight. There were no abdominal symptoms whatever. He eats anything when he desires, without hesitation.

Post-operative X-rays were taken, August 22, 1927. "Plates made of the stomach show a wide, freely patent pylorus, with a pyloric deformity characteristic of a Horsley operation. The meal passes freely through the pylorus and duodenum and the stomach is completely evacuated at six hours."

CASE II.—Male, age twenty-five years. Admitted November 30, 1925, with a diagnosis of acute perforated ulcer of duodenum. Excision of ulcer, Horsley pyloroplasty. Operation five hours after onset. The section revealed an indurated ulcer $1\frac{1}{2}$ cm. in diameter on the anterior superior surface of the first portion of the duodenum about 1.5 cm. from the pylorus. The ulcer was crater-like with hard edges.

The patient had an uneventful convalescence under routine gastroenterostomy diet. For about one year after the operation he was troubled with belching of gas after eating. He did not obtain complete relief with

diet and soda. Gradually he improved and when last seen, November 21, 1927, he was on a mixed diet with no gastric symptoms.

X-ray films, No. 9411, December 23, 1926, show a deformity of the pyloric end of the stomach and cap resulting from the Horsley operation and they show a wide patent pylorus with the stomach contents completely evacuated at six hours. The rapidity with which the meal leaves the stomach during the early stage of filling suggest too rapid emptying time.

CASE III.—Male, age thirty-three years. Admitted December 1, 1927, with a diagnosis of acute perforation of duodenal ulcer. Operation, excision of ulcer, pyloroplasty with drainage, was performed six hours after onset. There was an ulcer on the anterior surface of first part of the duodenum, one-half inch in diameter, one-quarter inch deep and perforated at its centre, with the escape of moderate amount of stomach and duodenal contents.

This operation was really a Heineke-Mikulicz instead of the Horsley.

Convalescence was uneventful except for an abdominal wall infection of a mild degree.

DOCTOR WHITE added that these three cases demonstrate a method of procedure which has not been used to any extent in the treatment of perforated duodenal ulcer. It has seemed to him that the closure of the perforated ulcer by a few sutures was not the best treatment. These ulcers, as a class, have thick indurated edges and the usual treatment has not removed the ulcer. It does not assure a removal of the pathology. On the other hand, the routine posterior gastro-enterostomy is inadvisable. In the first place, it spreads the infection in the peritoneal cavity; in the second place, it unduly lengthens the time of the operation; and in the third place, it does not remove the pathology. It has usually been said that a posterior gastro-enterostomy was indicated because of constriction at the pylorus due to inversion at the perforated site, but it has been well shown that pyloric obstruction, due to this cause, is very infrequent.

Excision of the ulcer at the time of the operation seems to be sound pathology and after the excision of the ulcer the use of the Horsley pyloroplasty is sound physiology. He did not mean to imply that this pyloroplasty is the operation of choice in treating chronic duodenal ulcers, but it seems that it can be well applied in this condition. The additional time required in relation to a simple closure is negligible.

DR. EDWIN BEER said that although perforated ulcers seem to heal after ordinary suture, there was no particular objection to making an excision such as had been done by Doctor White. In Germany, Kreuter has even gone further than Doctor White (whose technic has also been employed repeatedly in the Fourth Surgical Division of Bellevue Hospital, with far from satisfactory results) and advocated gastrectomy in perforated ulcers; and in a series of some sixty-five cases he claims a lower mortality than that from simple suture of the perforation.

DR. E. W. PETERSON said he had had no personal experience in the treatment of acute duodenal perforation by the Horsley operation, but that his

MELANOMA OF BUTTOCK

associate, the late Dr. Walter M. Silleck, had performed the operation a number of times, at the Harlem Hospital, and was enthusiastic about the immediate results.

FIBRO-SARCOMA OF NECK

DR. BURTON J. LEE presented a man, now forty-two years of age, who was first seen in November, 1921. He had presented himself for treatment at the Massachusetts General Hospital in 1911, complaining of a lump, which had been present in the left side of the neck for five years.

His physical examination, at that time, presented nothing unusual, except for the local condition, which was reported as follows: "On the left side of the neck, under the sterno-mastoid muscle, is a tumor the size of a halved orange. This tumor is hard, non-fluctuant, firmly attached to the underlying tissue, and raises with deglutition." He was operated upon November 6, 1911, by Dr. Jason Mixter, of Boston, the operation being an excision of the mass. The tumor was dissected free from the carotid artery and thyroid gland. The jugular vein was cut and ligated, the submaxillary space was cleaned free of all glands as far as the parotid. Malignant tissue was found to infiltrate the muscle and the glands of the neck and to extend along the side of the trachea and the inner surface of the thyroid gland. A small part of the tumor could not be removed from the posterior surface of the thyroid.

A pathological report by Doctor Whitney was as follows: "A large tumor from the neck infiltrating behind the thyroid gland lying against the trachea. On section it was firm and fibrous. On microscopical examination it was found to be composed of interlacing bundles of round spindle cells, with marked tendency to the formation of connective tissue. Fibro-sarcoma." The patient was discharged November 15, 1911, in good physical condition.

Nine years later there was a recurrence of the tumor in the left supra-clavicular fossa. This had been present for one year when the patient was first seen in October, 1921. He reported that for two months there had been slight pain in both sides of the neck and there was some interference with breathing, especially at night and on exertion.

Examination, at this time, revealed a mass about 4 centimetres in diameter, low in the left side of the neck, extending to the midline, adherent to the thyroid cartilage and disappearing behind the clavicle. The skin was not adherent to it and the mass itself seemed attached to the deeper structures.

The treatment of this patient consisted, first, of application of a radium pack over the tumor of the neck, giving a dose of 8145 millicurie hours at a distance of 6 centimetres with filtration of 2 millimetres of brass. Five days later under novocaine anæsthesia, the lesion was excised. It was well encapsulated, except at the lower pole, where it dipped into the thorax; here it tapered into a thin cord. This was divided and 14 glass tubes of radium emanation, a total of 19.8 millicuries, were buried in this area, and the remainder of the operative field. Post-operative convalescence was uneventful and the patient was discharged from the hospital ten days later.

There was no pathological report upon the second specimen removed.

The patient has remained well without evidence of recurrence after six years and two months.

MELANOMA OF BUTTOCK

DR. BURTON J. LEE presented a woman, who, at the time of her admission to the New York Hospital, in May, 1925, was forty-two years of age. She stated that, for many years, she had noticed a pigmented area in the

middle of the left buttock. About one month previous to admission, she was aware of an increase in the size of the lesion and slight tenderness had developed.

Examination revealed a robust woman, normal, except for the local condition. In the middle of the left buttock there was a pigmented lesion in the skin 1.5 centimetres in diameter and 0.5 centimetres thick. It was light brown in color. There was no ulceration in or about the lesion, nor could any induration or extension be palpated.

At operation, a wide ellipse of the skin surrounding the lesion and underlying fat, measuring $7 \times 4 \times 3$ centimetres, was removed. Great care was taken to prevent any traumatization of the lesion during excision. Convalescence was uneventful, except for a left femoral phlebitis.

The specimen removed was reported upon by Doctor Beattie.

"Specimen consists of elliptical-shaped piece of skin and underlying tissue measuring $7 \times 4 \times 3$ cm. Skin white, smooth and hairless. At mid-point of skin is a circular, firm, brownish elevation 1.5 cm. in diameter, 5 mm. thick. This pigmented portion extends through all layers of skin but apparently does not involve subcutaneous fat. Subcutaneous fat is glistening yellow and divided into lobules by fibrous connective tissue.

"Microscopic examination of frozen section shows a tumor composed of spindle-shaped cells some of which contain a great deal of brownish pigment. These cells have large oval nuclei, rather uniform, and appear to infiltrate at edges of growth. In some parts the pigment is very dense, obscuring the cells. Toward the skin surface there is more fibrosis and the pigment is confined to small nests. The most cellular part of the tumor appears to be in the lower layers of the skin connected with the fatty subcutaneous tissue. Paraffin sections will be prepared and an attempt to determine whether the tumor should be regarded as a simple melanoma or a melanosarcoma."

Subsequent pathological report, following the study of the paraffin section, was as follows:

"Paraffin in sections show that the tumor is very cellular, the cells show great variety in size and shape and appear to infiltrate the surrounding fatty and fibrous connective tissue. This picture is suggestive that the tumor has malignant properties."

This patient was presented as a case of melanoma, well, two years and eight months after operation.

DR. CHARLES E. FARR reported a case of a woman, forty-five years of age, who in 1923, came to him for treatment for a freely movable tumor of the scalp of many years' standing. He did a local excision under local anaesthesia and followed this by X-ray treatment to the scalp and neck. This was found to be a melanoma, $5 \times 4 \times 2$ cm. A year later she came back with a lump in the right side of the neck which she said had been present at the time of operation but which Doctor Farr had not noted, although he had made a careful examination. The lump was removed in the same manner as the previous tumor and was pronounced by the pathologist to be a sarcoma. She went on for a year and in May, 1925, just two years after the first operation, she came back with a mass in the skin of the right flank. This disappeared under X-ray therapy and she stayed well; seen in July of 1926 she seemed to be in good condition. In October, 1926, she had three metastatic deposits in the skin of the neck, the shoulder and the buttock.

MELANOMA OF BUTTOCK

A little later many lumps appeared, but the general health was excellent. Under X-ray treatment all the lumps disappeared. In May, 1927, she appeared again with a huge nodular mass in the liver and many nodes in the skin. She felt weak and nauseated, but was able to continue her work as a secretary until August, 1927, and died in September, with enormous masses in the liver, though appearing to be still in fairly good condition. These melanomas are remarkable cases and it seems impossible to predict the outcome. Some of them die quickly, but some of them live on for a number of years.

DR. WALTON MARTIN referred to a case in which the patient, a young girl aged sixteen, had had a pigmented mole removed from the heel by Dr. Charles Peck. Some months later she came under the care of Dr. W. A. Downes. At that time she had a mass as large as a fist in the groin. Doctor Downes excised this mass, which was made up of enlarged, deeply pigmented inguinal lymph-nodes. Sections examined under the microscope showed a structure resembling that of the malignant tumors derived from cutaneous moles.

DOCTOR DOWNES referred the patient to Doctor Martin for observation during his absence. A rapidly growing, dark colored nodule appeared in the skin of the back about six months after the removal of the inguinal nodes. It was excised and sections of the growth presented under the microscope an appearance similar to sections of the mass in the groin, of a rapidly growing melanosarcoma. Subsequently she was given extensive X-ray treatment under the supervision of Doctor Wood. About three years later she married. She had had two children and is living and well to-day, nine years after the last metastatic growth was removed from the back.

DR. HOWARD LILIENTHAL said that it was encouraging to see this result in Doctor Lee's case and even more so to hear of Doctor Martin's patient, alive after nine years, and to learn that these cases, usually regarded as invariably fatal, do sometimes get well. The first personal experience the speaker had had with this disease was with a medical man who had a pigmented mole removed from the axillary region, got prompt recurrence and metastases and died. Then he was called by Dr. Samuel Bandler to see a woman three years after he had operated on her for a small melanosarcoma. He had left a three-inch margin, removing the mole and its entire neighborhood; much as Doctor Lee described was done in his case. When Doctor Lilienthal saw her three years afterward she was dying, with enormous metastases in the liver. The speaker expressed a desire to know what Doctor Lee thinks about the right form of treatment in cases of this kind. Should they be operated on by the usual surgical method, with or without pre-operative radium pack or X-ray, or be operated on by some other method, such as using a cautery instead of a knife as Bloodgood advocates, or by excision with an electric diathermy knife. There should be some standard of treatment for these melanomas.

DR. DEWITT STETTEN said that he would strongly advise against electrocoagulation for the removal of pigmented moles. He spoke with feeling

as he had had an unfortunate experience with a pigmented mole of the breast which had been destroyed by electro-coagulation about three and a half years previous to the appearance of a dark bluish nodule in the neck, that looked like a thrombus in the external jugular vein. This nodule was excised for diagnostic purposes. It lay external to the vein and was found to be a melanocarcinoma. In this connection Doctor Stetten commented on the variations in the biology of these tumors and particularly on the unusual lapse of time of three and a half years, in his case, between the original disturbance and the development of the melanocarcinoma. Doctor Stetten's patient subsequently developed a generalized subcutaneous melanocarcinomatosis, and died in about six months of symptoms of cerebral metastases.

DR. EDWIN BEER said there was no doubt that these melanotic neoplasms varied greatly in their malignancy, which probably accounted for the varying results obtained on different cases. A striking illustration of this was the report of a melanosarcoma of the left eye (published by S. Olbert). Olbert found at autopsy, twenty-four years after removal of the eye, metastasis of the melanosarcoma in the lungs, heart, liver and bones.

POST-PNEUMONIC LUNG ABSCESS RUPTURING INTO THE PLEURA

DR. HOWARD LILIENTHAL presented a young woman and gave the following history of the case:

On March 13, 1921, he was called to see a woman, age about thirty, who had developed a right empyema with great distress in breathing and high fever about two weeks after the beginning of a right-sided pneumonia. A diagnostic aspiration produced opalescent pus. The same night, as an emergency procedure, he made a puncture with trocar and cannula, using the air replacement method. This is preferable, in acute pneumonic cases, to the valve tube or the water-seal, both of which tend to expand a lung which may still be infiltrated and not ready to function. Fifty-nine ounces were removed followed by much relief. A few days later two fluid levels were observed in the chest on X-ray examination. The left chest was normal.

A small intercostal thoracotomy was then done in local anæsthesia incising in the eighth interspace. Considerable pus was evacuated much thicker in consistency than before. Drainage by three tubes.

March 27, after a temporary relief and then a gradual rise in temperature to 103, fluoroscopy revealed movable lung, but there was an abnormal shadow below and a small pneumothorax in the lower inner part of the right chest.

Realizing that the case was not an uncomplicated empyema, he then performed a major intercostal thoracotomy, under nitrous oxide and oxygen. A long seventh interspace incision was made, resecting the eighth rib. The rib spreader made full ocular exploration feasible. The upper and middle lobes were not adherent, but were covered with confining membrane. The lower lobe presented an interesting picture. It was contracted and hard and there was a small opening upon its phrenic surface, where pus exuded from a pulmonary abscess of small size. Dense adhesions divided the chest into several distinct cavities. The entire lung was mobilized by peeling away the confining membrane and breaking up the adhesions. It was then possible by insufflation to expand the upper and middle lobes fully while the lower lobe showed but limited expansion. Pericostal stitches and a few sutures in the

LUNG SUPPURATION—METHODS OF TREATMENT

muscle layers closed the wound except for drainage space for several tubes. Only a little of the skin wound was sutured. Because of the presence of the lung abscess he could not sterilize the pleural cavity by the Carrel method and healing took place rather slowly but completely more than two and a half months later.

The patient has been well ever since, now nearly seven years. The case is presented, because it demonstrates so well the production of empyema by the rupture of a small peripheral abscess of the lung and also to illustrate the rational method of treating such conditions. He was convinced that if he had been satisfied with mere drainage, without exploration and mobilization, a chronic empyema would have resulted and probably broncho-pleural fistula at the site of the lung abscess. It is cases of this kind in which procrastination is to blame for long drawn out illness which may require many dangerous operations for its final cure.

LUNG SUPPURATION—METHODS OF TREATMENT

DR. CARL EGGERS read a paper with the above title, for which see page 485.

In connection with this paper he presented three patients whose histories are as follows:

CASE I.—R. G., forty-two years old, was seen December 4, 1926, complaining of pain in the right chest, cough and expectoration. He gave the following history:

He had not been well all year and had looked and felt run down. He had also lost a little weight; no other symptoms; no cough, no expectoration, no night sweats.

About the middle of September, 1926, he contracted a cold for which on September 29, 1926, he consulted a physician who diagnosed influenza pneumonia. He was sent to a hospital where he remained six weeks. During all this time he had cough and expectoration, sometimes more, then again less, and his fever varied from almost normal to 103. At first his sputum had a very disagreeable odor, later less so. He did not expectorate blood. Weight and strength gradually diminished. He finally was taken home in a very much weakened condition and continued under the care of his physician with the tentative diagnosis of unresolved pneumonia. November 25, he developed fever to 104, accompanied by an especially large amount of sputum with a little blood, but not of a particularly offensive odor. About that time it appeared to his physician that the physical signs in the chest were beginning to change, and that there were signs of cavitation over the area of consolidation. The patient continued to run fever and had lost in all about thirty pounds since the summer.

At present his chief complaint was: Cough and expectoration, and loss of strength. No night sweats. No pain. No symptoms in relation to other organs. The past history and family history had no relation to his present illness. There was no tuberculosis in the family.

He was a frail man of ninety-eight pounds, who looked as if he had lost weight. His cheeks were flushed. He coughed a great deal and expectorated pus with a disagreeable odor. General examination showed nothing of importance, except moderate clubbing of the fingers. The pulse varied from 96-106. Temperature was 102.2. Examination of the chest revealed the following:

Anteriorly: Expansion equal both sides. Physical signs equal and normal both sides.

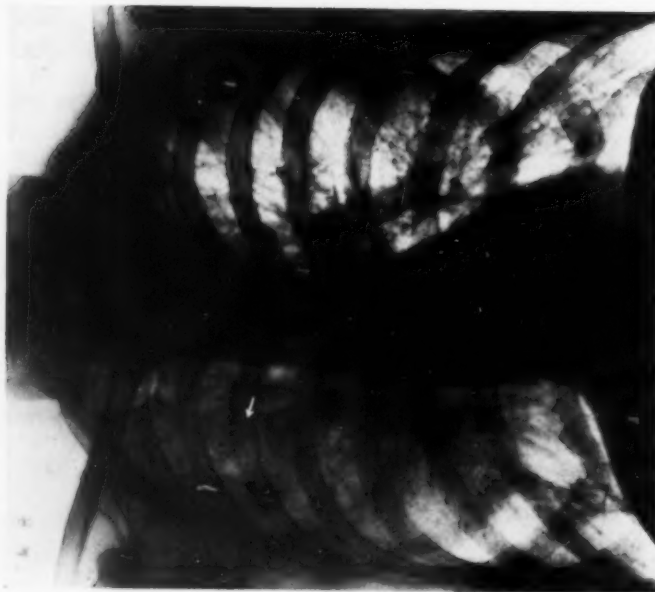


FIG. 1.—Case I. Acute post pneumonic lung abscess of right upper lobe.



FIG. 2.—Case I. Six weeks after operation, showing clearing of lung, and drainage tube still in place. Patient healed soon after and has remained well. Opposite lung shows retained lipiodol.

LUNG SUPPURATION—METHODS OF TREATMENT

Posteriorly: Expansion about same both sides. There is dulness bordering on flatness on the right side, beginning about one finger above the level of the crest of the scapula and extending downward to about two fingers above the level of the tip of the scapula. Below this level there is diminished resonance while at the apex it seems to be normal. Over the area of dulness and extending forward into the posterior part of the axilla there is bronchial breathing which at times seems to be cavernous. Signs change frequently.

The impression was that they were dealing with an abscess of the upper part of the lower lobe.

Further observation showed that he expectorated about 500 c.c. of foul sputum a day which contained non-haemolytic streptococcus, pneumococcus, and micrococcus catarrhalis. Repeated examinations for tuberculosis and elastic fibres were negative.

X-ray examination revealed a dense shadow in the right upper chest containing a large cavity with fluid level. (Fig. 1.) A bronchoscopy by Doctor Kernan verified this finding. Pus was seen to flow from the upper lobe bronchus, which on culture showed short chain non-haemolytic streptococcus, pneumococci, micrococcus catarrhalis and an anaërobic Gram-negative bacillus, type undetermined. An injection with lipiodol did not enter the abscess cavity.

December 21, 1926, an exploratory puncture was done in the sixth interspace posteriorly and thick foul-smelling pus obtained which on smear showed short chain streptococcus, pneumococci and a few fusiform bacilli. On culture only pneumococci grew, but an anaërobic culture showed some spirochaetes and an occasional fusiform bacillus.

He was operated on December 22, 1926, under local anaesthesia: Vertical incision parallel to the posterior border of the scapula, and about $1\frac{1}{2}$ inch within its border, extending over the sixth, seventh and eighth ribs. The seventh rib was exposed and about two inches resected subperiosteally. Exploratory punctures through the bed of the rib showed foul-smelling hemorrhagic fluid one place, and thick foul-melling pus another place, after entering through a very dense layer of tissue. The lung was apparently firmly adherent. An incision was therefore made alongside the needle and an intrapulmonary cavity was entered. At first there was but little pus, but when a finger was inserted and the patient coughed, there was expulsion of pus and necrotic lung tissue, while the patient expectorated the same material. He was quite upset but his condition remained good. There was apparently extensive bronchial communication. Moderate bleeding. A large iodoform gauze tampon was packed into the cavity and another tampon was packed around it to keep the outer wound open and prevent absorption. No sutures were placed. He had stood the operation quite well.

The convalescence was uneventful. The sputum diminished in amount and changed in quality, the temperature gradually came down and his weight began to increase. The superficial tampon was removed on the sixth day, and the deep one on the eighth day, and was replaced by three soft rubber tubes. The cavity, which at first was about the size of a goose egg, gradually contracted. The patient was allowed out of bed eight days after operation and was discharged January 22, 1927, just a month after operation, and with a gain in weight of eighteen pounds. He was allowed to close soon after and has remained well. His lungs are clear. (Fig. 2.)

CASE II.—J. C., fifty-six years old, first seen May 17, 1927, complaining of cough, expectoration and hæmoptysis. His present illness dated back to



FIG. 3.—Case II. Chronic lung abscess, access to which was difficult on account of its posterior position, under the scapula.



FIG. 4.—Case II. Nine months after drainage operation through a high axillary approach. Bronchial fistula being kept open at present.

LUNG SUPPURATION—METHODS OF TREATMENT

March, 1926, when he began to have cough and expectoration of foul pus. He stated he had had no fever, but frequently had cold sweats. Cough and expectoration would let up for a while and then return for one to three weeks, when another period of rest would set in. During attacks the sputum always tasted and smelled very disagreeably. He thinks some days he raised as much as a quart, though he never actually measured it. He had lost about ten pounds in weight. In January, 1927, he began to have frequently recurring small hemorrhages, usually about half a cup full, though on one occasion there was a large quantity. He is able to feel filling up of a cavity within his chest, when full, he is very uncomfortable, and pain develops in the front of the right chest, near the nipple. When empty he has no pain. He had been on bronchoscopic treatment since January, 1927, and thought that it had helped him much.

For about ten years he had been troubled with coughing and sneezing, but he never had a severe attack of an intrathoracic condition until four years ago when he had an attack of what he calls pneumonia. It confined him for nine months. Toward the end of the convalescent period he had a severe coughing spell one night and expectorated a 1¼-inch nail. There was no bad odor or taste at that time, however. He is a latherer by trade and holds nails in his mouth while at work and frequently swallows one. He thinks one of these nails may have entered his lung and produced the pneumonia and the subsequent abscess.

On admission the patient did not look particularly sick. His temperature ranged from 100–101. He weighed 172 pounds. He expectorated 250 to 400 c.c. of foul sputum in twenty-four hours. During several weeks of observation he had a number of hemorrhages, his temperature showed a tendency to rise to 102, and over, and he lost weight.

The sputum showed on culture staphylococcus albus, non-hæmolytic streptococcus, pneumococcus and micrococcus siccus. Numerous specimens were negative for tuberculosis.

X-ray examination revealed a dense shadow in the right side with cavity formation and a fluid level. (Fig. 3.) It was situated under the scapula, and seemed to be very inaccessible. But as operation seemed to be the only way to save this patient, it was decided on.

Operation June 6, 1927, under local anæsthesia, a four-inch incision was made high up in the axilla, parallel to and just below the border of the pectoralis major. Muscle retracted upward and ribs exposed. About two inches of the fifth rib were resected. Underlying pleura was found to be thickened. Exploratory puncture showed thick foul pus at depth of 2 inches. With an electric cautery the cavity was entered alongside the needle, and the opening was then enlarged with a finger. The cavity was about the size of a walnut, had a fairly smooth lining, and in addition to pus contained necrotic lung tissue. There was brisk bleeding and the patient expectorated a small amount of blood. It was controlled by gauze pressure. An iodoform gauze tampon was inserted into the cavity, surrounded by a superficial plain gauze tampon. The patient stood the operation well, and the convalescence was satisfactory except for the fact that there was a great tendency for the fistula to contract. He was discharged August 4, 1927, and treatment was continued, but in spite of all precautions the wound contracted to such a degree that retention developed, which was again accompanied by rather severe hemorrhages, both from the wound and *via* the bronchi.

He was therefore readmitted for operation; which was performed October 25, 1927. Under local anæsthesia the sinus tract was completely excised and

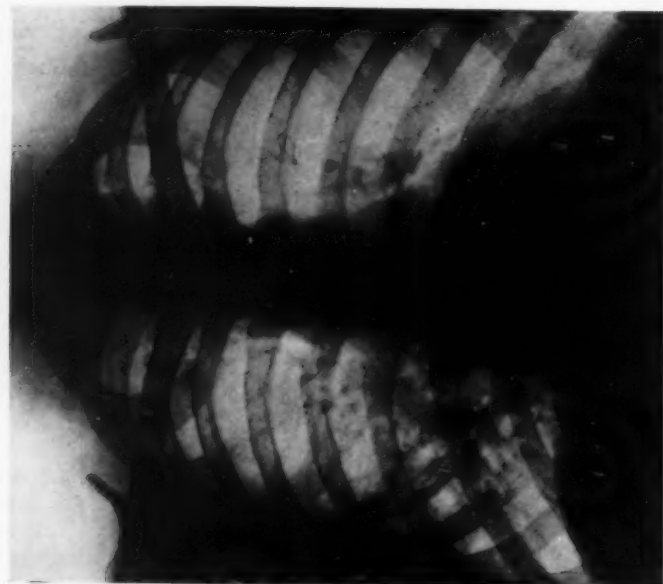


FIG. 6.—Case III. Eight months after drainage operation through bed of fourth rib anteriorly. Bronchial fistula persists, but gives off only a little mucus secretion. Patient well and strong.



FIG. 5.—Case III. Chronic bronchiectatic abscess of four years' duration.

LUNG SUPPURATION—METHODS OF TREATMENT

the ends of the formerly resected rib were removed in normal tissue. For better exposure the rib above was likewise removed and the pleura then mobilized over a wide area. The rigid ring contracting the opening into the cavity was incised and dilated with the finger and the abscess cavity cleaned out. This entire procedure had mobilized the affected lung tissue somewhat and promised to favor healing. A large soft rubber tube was inserted and the wound left wide open. The patient did very well, cough and discharge diminished, but severe hemorrhage continued until on November 15, the cavity was burned out with a hot soldering iron. From that time until to-day there has been no further bleeding and the general condition has steadily improved. The X-ray shows clearing of the lung and the prognosis for a permanent cure is good. (Fig. 2.)

CASE III.—G. K., first came under the reporter's care, February, 1924, for an old suppurative lesion of the chest dating back five years. It had started insidiously in August, 1919, apparently with a pleurisy. This was tapped twice. During the convalescent period he began to cough and pneumonia was diagnosed, for which he was admitted to the Lenox Hill Hospital. An examination at that time showed an area of dulness corresponding roughly to the middle lobe. He expectorated 120 c.c. of foul sputum daily. His temperature did not rise above 100. He had 17,450 white blood-cells with 78 per cent. polymorphonuclears. A diagnosis of lung abscess was made which was verified by X-ray and bronchoscopy. The sputum was negative for tuberculosis. There were no elastic fibres present. As there was slow, but steady improvement, he was discharged October 12, 1919, with instructions to remain under the care of the bronchoscopic department. During the next few years he had periods of comparative well being alternating with periods of acute exacerbation of the lung focus. He was bronchoscoped many times with improvement, but no cure resulted. X-rays taken from time to time show the process never entirely cleared up. When first seen by the reporter he had not been bronchoscoped for five months. He stated that he had had no foul expectoration since that time, but that he had a pulmonary hemorrhage every three or four weeks, coughing up 50 to 100 c.c. of clotted blood each time. The day before admission he had a severe one. The hemorrhages were often followed by nausea and vomiting. The X-ray examination showed a small cavity within an area of density situated anteriorly in the right chest. (Fig. 5.)

February 11, 1924, operation, first stage, local anæsthesia.

The entire cartilage of the fourth rib, and a small section of the rib were resected. The internal mammary vessels were ligated, and the thoracic fascia divided, exposing lung and pericardium. There were apparently no adhesions. Operation therefore interrupted and tampon inserted. Though the intervention was slight, the patient developed a post-operative pneumonia on the opposite base. After recovery the second stage was performed.

February 23, 1924. Tampon removed. Additional two inches of the fourth rib and a section of the fifth rib with its cartilage were removed. Exploratory puncture showed thick pus. With a cautery a hole was burned into the lung down into the cavity, which was the size of a walnut and had hard trabeculated walls. There was brisk bleeding which could be controlled only by hæmostatic sutures. Several bronchial openings were present. The cavity was left open and has resulted in a bronchial fistula which is still present, but which gives off practically no secretion, and is ready to be closed. After operation hemorrhages ceased entirely and the patient has remained well and strong. The lung infiltration has cleared up completely. (Fig. 6.)

DR. WILLY MEYER said regarding the place of bronchoscopy in the treatment of lung suppuration, at the Lenox Hill Hospital, if these thoracic patients do not require immediate surgery, they are referred to the bronchoscopical department.

Early, better called prophylactic treatment, is of particular importance in suppurative inflammation due to aspiration. By means of endobronchial treatment the further development of the disease can be cut short. Long-continued treatment carefully carried out by specialists has shown what can be accomplished. In these border line cases bacteriologist, radiographist, bronchoscopist, and surgeon must work hand in hand together. The bronchoscopist will not keep these cases too long; if not satisfied with his results, he will refer the proper cases back to the surgeon.

Second: As to abscess near the division of the main bronchi, at the root of the lung. These cases are particularly favorable to bronchoscopy and may thus be cured. But if they need surgical treatment, he would call attention again to the method proposed by Sauerbruch two years ago, continuous compression. He exposed the pleura widely, dividing, but not excising the muscles, put on the pleural surface a layer of paraffin, and sutured muscles and skin. The extensive continuous pressure, thus exerted, cured the trouble in some cases. In others fever developed and the pus perforated into the area where the paraffin had been deposited. By partially reopening the wound, pus and paraffin were discharged. Of ten such cases ten were cured. After bronchoscopy has failed to cure these cases, this conservative operation deserves attention.

DOCTOR LILIENTHAL remarked that the last one shown was a perfect example of lattice lung, one of the most difficult conditions to cure. The speaker did not believe it could be closed except by covering in the cavity from the outside. This would by no means promise a good result. It should not be forgotten that in all these cases the principal danger is that of hemorrhage; even after years have elapsed they are apt to bleed. The last case of lattice lung in Doctor Lilienthal's experience developed a malignant growth, and at the present time he has a case under his care that is giving him anxiety. The patient is a woman on whom he operated for lung abscess. His operation—drainage—stopped profuse expectoration and cough but she now has an open cavity like that of the patient shown to-night. Trying to snip off a small cone to get a specimen of the wall started a furious arterial hemorrhage which led to the belief that there are aneurysmoid vessels there which forbid any procedure except, perhaps, a cautery operation. He has two patients in this class who have healed up perfectly and seem to be absolutely well. One, a young man, was having a severe hemorrhage, and the speaker was called from a distance to stop this, which he did by wide thoracotomy, exposing the vessel and putting a stitch around it. The man got well and the cavity lined by lattice lung completely closed. He came in recently to be looked over because of another ailment and a röntgenogram revealed a considerable cavity perfectly circular. So far as his lung symptoms go,

LUNG SUPPURATION—METHODS OF TREATMENT

he is well and has no cough. This condition might be brought about in Doctor Egger's case by roofing over the abscess.

DOCTOR LILIENTHAL noted that Doctor Eggers had made no attempt to standardize operations on the lung. Trying to do that will not only tend to put a stop to original work, but will encourage operations by wrongly selected methods. The only point in which the speaker differs with Doctor Eggers is in the manner of operating in cases of pure lung abscess not connected with the bronchus. Doctor Lilienthal considered it unfortunate if the abscess connects with a bronchus because it means a fistula, more or less persistent. If one can get into the abscess before it connects with a bronchus the tendency is for the wound to close, since every cough or strain forces the walls of the cavity together, while with a bronchial fistula the walls are blown apart.

As to Doctor Eggers' comment that many of these cases have an insidious onset, that has also been Doctor Lilienthal's experience. The first sign of trouble may be putridity of the breath and then the case is usually pretty far advanced. It is important that medical men be educated to have X-ray pictures made of the chest in unexplainable cases of malaise and continued fever, even though there be no cough.

DR. DEWITT STETTEN said he would like some suggestions as to the best plan of procedure in acute cases where one cannot wait and where operation becomes imperative. A little over a year ago he saw a case with an acute abscess in the upper lobe of the right lung. The patient did not tolerate bronchoscopy and became so sick that operation was practically forced. On probatory puncture of the chest air was withdrawn, showing that there had been a perforation, and that a beginning pyopneumothorax existed. An attempt was made to enter the chest over the abscess, but unfortunately the lung was not adherent to the chest wall, as was to be expected from the air in the pleural cavity, so that the operation was done through the free pleural cavity. The abscess was readily found and drained. The patient died within twenty-four hours. In these cases one seems to be placed between Scylla and Charybdis, the patients die if one operates, and they also die if one does not operate.

DOCTOR EGGERS, in closing the discussion, emphasized the importance of knowing what one has in mind when speaking of the treatment of lung abscesses. One has to have a mental picture of the probable pathological process, and one has to consider the time since onset of the condition. There is a great difference between acute and chronic cases. In the case referred to by Doctor Stetten, with a well-defined cavity and fluid level, an operation done in two stages might have brought about a cure. Such cases usually do quite well; as a matter of fact they are the most favorable ones for surgical treatment. If on the other hand, perforation into the free pleura had taken place before operation, at once infecting the entire pleural cavity, the prognosis was thereby made much worse, because the resulting condition resembled a traumatic empyema. Drainage of the empyema would then have

been the proper procedure. It cannot be denied, however, that many of these acute cases are doomed to die in spite of all that is done for them. Some of the gangrenous abscesses have aspirated putrefactive material, and they contain spirochaetes. They are probably given the best chance with conservative treatment in an attempt to bridge over the acutely septic stage.

DR. HUGH AUCHINCLOSS said that one of Doctor Eggers' cases recalled to his mind two somewhat unusual cases of lung suppuration. Both had closed to a small bronchial fistula that it seemed wise not to close. One was a child who had a story of having been operated on for an empyema every fall for the first three years of his life—three empyemata in three years. In the fourth year this occurred again. Doctor Auchincloss saw him then and operated on him. The following year the same thing happened. Doctor Auchincloss operated again and found a pleuro-pulmonary type of abscess with a well-defined bronchial fistula. Two ribs and some of the chest wall were removed. The wound did well, closing almost completely, save for a small bronchial fistula. This tiny opening has been allowed to persist. He has remained well and spends every winter in the south. If he gets a cold the bronchial fistula pours out pus. The other case is that of a woman in her thirties who had a lung abscess in the left upper lobe following tonsillectomy. Though studied and treated at length at Saranac, it became progressively worse. Rib resection and cauterization of the lung was done and she did well. A very small bronchial fistula persisted. Whenever there is coughing pus pours out. One should not overlook the value of a bronchial fistula as a safety valve.

DOCTOR AUCHINCLOSS wished to call attention to the danger in opening lung abscesses with open bronchi in their walls when the patient is under general anaesthesia and resting on the well side. Lipiodol injections have fully demonstrated the readiness with which the injected substance passes from one bronchus to another by postural change only. Mucus is tenacious and flows with difficulty, but many lung abscesses contain pus that is fluid in consistency and contains relatively little mucus. That this material may gravitate into the bronchi of the well lung has long been recognized and undoubtedly occurs. Many patients seem to be able to stand this, however, especially if the operating table has the head lowered or raised, the former to allow pus to run out the mouth, the latter (in lower lobe cases) to leave it undisturbed. What happens, on the other hand, the moment the cavity is opened, is a somewhat different matter. It is precisely at that time that many such cases have suddenly changed for the worse, and every once in a while have died. As the chest wall is lifted out in inspiration before opening the cavity air is pulled through the glottis and distributed everywhere in such measure as conditions permit. The cavity is but little affected and its fluid contents do not leave it. The instant the cavity is opened through the chest wall, however, a new route for air to be carried to the lungs, a new "glottis" has been established and with every inspiratory effort the purulent contents of the cavity are atomized, as it were, to all parts of the lungs along

LUNG SUPPURATION—METHODS OF TREATMENT

with the air. If the cavity contents be not immediately removed, or the rush of air through the hole in the chest checked, or the aspirated material coughed up and cleared out by the doctor's or the patient's own efforts, either immediate suffocation or widespread bronchial diffusion of the infection occurs. Of course there is nothing new in stating these facts, but it is still worth emphasis so that adequate precaution may be taken for prevention. When in doubt it is far safer to locate the cavity as accurately as possible, resect one or more ribs as the case may require, then pin small safety pins attached to gauze directly into the tissues by bed of the rib, in different parts of the wound's depth as close to the lung as possible and leave open, using rubber dam with gauze packed into it. Subsequent X-rays can be taken or fluoroscopy done and the cavity opened at its most approachable place, using the safety pins as markers. This can be done often without even an anæsthetic and the patient sitting up and in control of his reflexes. The risks incidental to needling and opening lung abscesses with open bronchi in their walls requires periodic and earnest emphasis, for they are genuine. Irreparable damage may occur in the twinkling of an eye in these procedures and the risk become apparent too late in the desire to "complete the job" all at one time.

BRIEF COMMUNICATIONS

NONMALIGNANT PAPILLOMA OF THE UMBILICUS

Recently a colleague, referred a man fifty-seven years of age, on account of a supposed cancer growth of the umbilicus. My surprise centred itself on the part of the patient's anatomy involved, the umbilicus. I remembered only faintly having read of growths, malignant and benign, of the umbilicus, but had seen none. Interest became more acute when I recalled former years of active service with a Railroad System where physical examinations and close inspections of the body were routine measures. In this service I had occasion to see some fifteen thousand navels. I fail to recall a single

instance of a pathologic condition suggestive of a growth, benign or malignant. The abnormal conditions encountered were usually hernias and infections caused by filth.

In my service of eighteen years at a City Hospital, an institution of 800 beds, where abdominal examinations were frequent, I cannot recall a single case of a growth involving the umbilicus.



FIG. 1.—Papilloma of the umbilicus.

The acquisition of this one case has served as a sharp stimulant to augment my knowledge and this I succeeded in doing by perusing Cullen's "The Umbilicus and its Diseases." In this work there can be found much of the scattered knowledge about the umbilicus and its diseases. This can be readily appreciated by the student in search for information pertaining to lesions of the umbilicus, inasmuch as the literature appears to be rather scant.

Perhaps the most extended contributions on umbilicus diseases have been made by Nicaise in 1881, by Reginald Fitz, of Boston, in 1884, by Pernice, who expressed his views on umbilical tumors in 1892, and by Runge who wrote on umbilical infections in 1893. In 1911, there appeared an article on "Surgical Diseases of the Umbilicus" in the *Journal of the American Medical Association* by Dr. Thos. S. Cullen.

It may be of interest to note that there are only eleven cases of papilloma of the umbilicus chronicled in the work of Cullen obtainable from the literature. The first case recorded was seen by Fabricius von Hilden, in 1526, and cited by Küster in Langenbeck's *Archiv. f. klin. Chir.*, 1874. The last case in the series was a patient of Dr. W. T. Watson and was reported in 1910, "personal observations by Dr. Thos. S. Cullen."

In the case now reported, a man, fifty-seven years of age, the health

CHRONIC PANCREATITIS

had been good and his physical condition excellent. He stated that the first intimation of anything wrong with his navel was an itching, which was somewhat relieved by his morning bath. An ointment prescribed by his physician gave considerable relief. During the next four weeks, although the itching had almost subsided, the condition of the navel did not seem to have improved. There appeared a soft reddish mass which involved the navel. This mass extended beyond the skin level and was not painful. It continued to grow rapidly and bled freely during the following two weeks, when removal was advised. On examination it was found that the umbilical depression was filled with a warty protruding mass (Fig. 1) covered with an elongated papillary growth, the whole resembling in shape and appearance a large raspberry. The tumor appeared free from discharge. There was no odor and the color was pinkish. The abdominal wall surrounding the papillary growth was normal and free from irritation. Upon close inspection it was found that these papillary masses were attached to a broad pedunculated base at the bottom of the umbilical pocket.

On microscopic examination, made by Doctor Klenk, the growth was found to be a papilloma and not malignant. Even though the microscopic examination excluded malignancy, it was excised with a liberal sacrifice of healthy tissue.

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CHRONIC PANCREATITIS IN ROUTINE NECROPSY EXAMINATION*

Clinically chronic pancreatitis is associated with upper abdominal pathological lesions. It is generally assumed to be a sequela of gall-bladder infection and ulcers of the stomach and duodenum. When one follows cases of gall-bladder disease which have been submitted to operation, either for simple cholecystitis, or cholecystitis and cholelithiasis, one cannot help but be impressed with the number of cases which complain of abdominal discomfort. The complaints are more or less characteristic of the original pain, and the attacks may simulate those of cholelithiasis. Attacks of severe abdominal pain are encountered in post-operative cases of chronic cholecystitis. One is hardly justified in trying to explain these recurrent attacks as overlooked biliary calculi. Judd and Burden² have reported a series of twenty-four cases of non-calculous intermittent biliary obstruction following cholecystectomy in which the findings after an exploratory laparotomy were pancreatitis in seventeen cases out of twenty-four, the common duct being patent in all. Deaver reported seventy-nine patients with chronic pancreatitis at the Lankenau Hospital, of which 72 or 91 per cent. showed evidence of biliary infection. Forty-two cases, or 53 per cent., had calculi. W. J. Mayo³ reported that 90 per cent. of the cases having acute and chronic pancreatitis had been

* The pathological studies were made by Dr. Paul Klemperer, formerly Associate Professor of Pathology at Post-Graduate Hospital, and now Pathologist at Mt. Sinai Hospital; and Dr. Boris Kwartin, Associate in Pathology at Post-Graduate Hospital.

BRIEF COMMUNICATIONS

operated on for an infected gall-bladder, usually with gall-stones. Whether chronic pancreatitis is frequently encountered in healthy people is the question prompting this study.

We have studied fifty cases of accidental death and sixteen cases of death from acute abdominal infection, in an effort to determine whether the pancreas was involved in either group. This material has been obtained from the mortuary of Bellevue Hospital, through the courtesy of Dr. Charles W. Norris, Chief Medical Examiner of the City of New York; and Dr. Douglas Symmers, Director of Laboratories at Bellevue Hospital.

GROUP I.—This material was obtained from fifty people meeting with accidental death. So far as we know these people were in normal health at the time of their death. Sections were taken from the gall-bladder; two sections from the liver, one from the surface and another from the central portion; a section from the duodenum at the entrance of the common duct; three sections from the pancreas, including one from the head, one from the tail and one from the body. The appendix was also studied. The causes of death in this series included thirty-five from fractured skulls, one from a stab wound of the neck, three from ruptured livers, three from fractures of the pelvis, four from stab wounds of the chest, four from gunshot wounds of the abdomen, with hemorrhage, and one from a rupture of the heart due to a fall. The ages in this series ranged from eighty years to four years, the average age being thirty-seven and seven-tenths years. There were thirty-eight males and twelve females. Of the material studied in this group only two showed a mild chronic cholecystitis. Sections of the liver were negative for a chronic hepatitis, and the three sections from the different portions of the pancreas failed to reveal any evidence of pathology. Sections from the duodenum were negative.

GROUP II.—This series included sixteen people dying from acute peritonitis. There were eight cases of abortion with general peritonitis, two cases of ruptured and duodenal ulcer with peritonitis, one case of ulcerated colitis with peritonitis, two cases of acute appendicitis with general peritonitis, two cases of stab wounds of the abdomen with peritonitis, one case of middle ear infection, meningitis, and general septicæmia, with peritonitis. This group included nine females and seven males, the average age being thirty-one years. The sections taken from the pancreas failed to show any evidence of acute or chronic pancreatitis.

Although a mild degree of chronic cholecystitis was found in two cases of the first group, the pancreas failed to show any evidence of pathological lesions in either group, but as chronic pancreatitis bears a definite relation to upper abdominal infections, this series will only tend to prove that the pancreas is usually not easily infected. Whether chronic pancreatitis is produced through the lymphatic route or by ascending through the pancreatic ducts is still a debated question, but from the clinical evidence the lymphatic theory seems to have more support. It has been our aim to obtain pancreatic tissue from cases of gall-bladder disease which come to autopsy, but we have been

TRANSVERSE INCISION FOR UNILATERAL HERNIA

unable to get sufficient material to be of any value as yet. By this means we hope to prove whether chronic pancreatitis, as stated by Deaver and Pfeiffer,¹ is localized to the triangle of pancreatic infection between the duodenum and converging ducts of Santorini and Wirsung, or whether it involves the entire gland.

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TRANSVERSE INCISION FOR UNILATERAL HERNIA

The transverse incision for operation on bilateral inguinal herniæ has been found very satisfactory and has several advantages over the old double oblique incisions. It is now quite generally used.

For unilateral inguinal hernia, a transverse incision, running from middle of Poupart's line to midline of the abdomen, will be found equally suitable and satisfactory. Even femoral herniæ are well exposed with this method. After some experience with this incision, I prefer it to the usual method for several reasons. Excel-

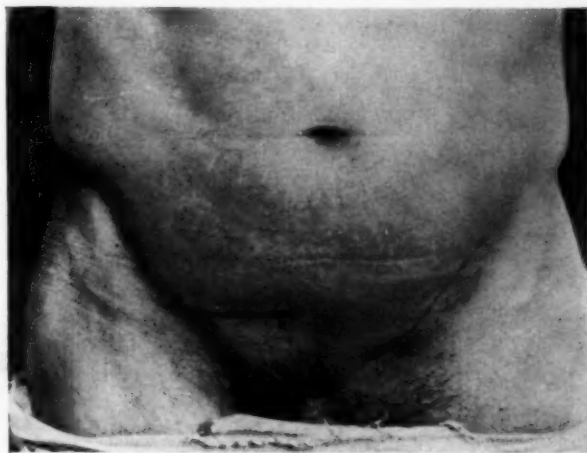


FIG. 1.—Shows transverse incision on right, and usual oblique incision on left.

lent exposure is obtained with a shorter skin wound. The incision is kept away from the groin with its skin folds and loose tissue. There are fewer vessels that require tying. Application of the dressing is easier. The line of suture of superficial fascia does not parallel the cord. The operative field can be much better protected than with an incision running toward the groin.

In cases where it is necessary to do some intra-lower abdominal work, in addition to a hernioplasty, this incision can be lengthened and used as in the Pfannenstiël method. The usual nerve block injection anesthetizes the line of incision.

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BOOK REVIEW

EXIGENCIES OF A GENERAL PRACTICE. By the late NATHAN CLARK MORSE, M.D. Revised and rewritten by AMOS WATSON COLCORD, M.D. Second edition. St. Louis, The C. V. Mosby Co., 1927.

Ten years after the first appearance of this work, Colcord emulating the monitions of Morse, "Learning to do things better," pays him homage in this revised and rewritten second edition.

What it may lack in effectively coping with exigencies, it makes up in its comprehensiveness, since everything comes in for consideration from adhesive plaster usage to toxicology, always profusely illustrated. It impresses one as an unabridged "First Aid Manual" or "Minor Surgery" in a major key for the use of physicians remote from medical centres, the "die hard" country doctor of the old school.

But rapid means of transportation has taken the "urge" out of emergency and placed the rural surgical and medical clientele on a par with the urban, and surely the exigencies of the great war demonstrated nothing better than that the place to administer effective emergency treatment was at the base. All else was "First Aid," wherefore in conclusion we submit that though replete in what it proffers, the effort that produced this handy reference book was worthy of a better purpose other than the quixotic plan to bring the mountain to Mohammed.

MARTIN W. WARE.

EDITORIAL ADDRESS

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